

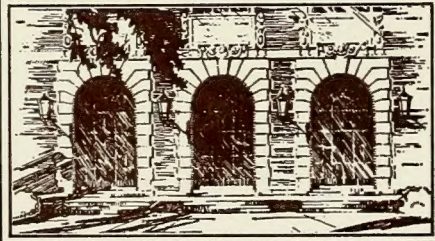




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ILLINOIS NATURAL  
HISTORY SURVEY















# ILLINOIS BIRDS: Ciconiiformes

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Fig. 1.—Subadult great blue heron (lacks the white crown and black head plumes of the adult). This largest Illinois heron stands a meter or more tall and is actually more gray than blue. Photograph by George W. Bennett.



# ILLINOIS BIRDS: Ciconiiformes

Jean W. Graber, Richard R. Graber, and Ethelyn L. Kirk

This paper includes data on four Families—Ardeidae (herons), Ciconiidae (storks), Threskiornithidae (ibises and spoonbills), and Phoenicopteridae (flamingos)—covering Illinois records of the Order Ciconiiformes. Though earlier papers in this series covered only one Family each, the present paper in other respects follows the same general patterns of coverage, methods, and procedures.

From 1973 through 1977 we attempted to locate and census heron nesting colonies throughout the state and adjacent boundaries by (1) inquiries to other observers and (2) ground and air searches of suitable habitat. The potential habitat in Illinois was vast, and our search was not exhaustive. We did fly most of the (Illinois) lengths of the Mississippi, Illinois, Sugar, Kishwaukee, Rock, Fox (north), Kankakee, Vermilion (north), Embarras, Kaskaskia, Wabash, Little Wabash, Elm, Fox (south), Big Muddy, Little Muddy, Cache, and Ohio rivers, plus Crooked Creek (west of Centralia) and the Skillet Fork. The flights were made mainly in May and July, 1973–1977 by R. R. Graber. A number of suitable looking, potential nesting areas were not covered for lack of time and funds. Notable among these were major branches of the Kaskaskia (Silver and Shoal creeks), the Big Muddy (Galum and Beaucoup creeks), and the Illinois (Macoupin Creek, La Moine, Spoon, and Mackinaw rivers), plus the Green River and numerous smaller streams. There may be many colonies that we have not found. Lusk Creek, a relatively small stream in Pope County, has had at least three heronries in the past 15 years, and there are many streams of similar nature that we have not searched. Except for the Mississippi, Illinois, Kaskaskia, Ohio, and Wabash rivers, our aerial surveillance included only one trip per stream, and we may have overlooked colonies. In at least two instances we learned that we had flown past colonies without detecting them. Heron colonies may also have been established on some streams after we searched them. We began our search in 1973, and our census record is least complete for that year, improving in subsequent years. Our aerial surveillance trips were almost always made in a high-winged Cessna 150 or 172, flown 122–244 meters above local terrain at an air speed of 115–130 km per hour. When we found a colony, we circled in

tight turns 244 meters directly above it, and looking through  $7 \times 50$  binoculars, attempted to count active nests. We also attempted to determine nest contents, but it was often very difficult even to see the nests. This was particularly true of colonies in stands of silver maples and cottonwoods, notably on the Illinois River. Nests were easier to count in sycamores, cypress, gum, and dead trees. Though we attempted to count individual nests, in tabulating the counts (e.g., Table 1) we have rounded figures above 5 to the nearest 5 nests in recognition of the difficulty of obtaining truly accurate counts.

We also attempted to census most of the colonies from the ground. For larger herons aerial counts were often higher than ground counts, the disparity probably resulting from one or more of these causes: (1) some colonies (e.g., Shobonier before 1975) had nests widely dispersed over large areas ( $2 \text{ km}^2$ ), making it difficult to find all nests from the ground, (2) inactive nests or clusters of branches, which looked like nests, were counted as active nests from the air, and (3) nests were sometimes counted more than once from the air. Another source of discrepancy between air and ground counts stems from wind damage to colonies. When we visited the East Dubuque, Sabula, and New Boston colonies, 22–24 July 1974, we found that many nests had been destroyed by a windstorm in June, and the damage had not been detected by R. Graber's census flight in early July. The number of active nests (pairs of breeding herons) had actually been much larger before the storm. Another possible source of error stems from the habit of herons—at least great blues and great egrets—of occupying colony sites (even deserted sites) temporarily during their spring migration. Single counts of colonies, especially if made before May, may include birds at nests that will not be used for nesting.

We were concerned about the effects of our visits upon the colonies and tried, both during air and ground surveillance, to keep our visits as brief and unobtrusive as possible; we visited each colony no more than twice (once from the air and once from the ground) per year. During our ground visits to colonies, we: (1) counted active nests of each species, (2) tried to ascertain the number of large young per nest, (3) collected food items disgorged by nestlings, (4) identified and counted nest trees, and (5) measured nest heights and sizes of nest trees. Nest heights were measured with an optical device (Optical Tapemeasure) with an accuracy range of 6.3 cm

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at a distance of 7.6 m and 0.8 m at 30.5 m. We rounded all readings to the nearest 1.5 m.

Because of the demonstrated relationship between chlorinated hydrocarbon pesticide pollution and egg-shell thinning in herons (Faber et al. 1972), we measured some eggshells of great blues and great egrets. Most of our visits to colonies coincided with the latter part of the nesting cycle, by which time eggshells on the ground were usually badly broken, but in 1977 we retrieved some eggs intact enough to measure. The sample was fortuitous and may be biased in a number of ways, but there was no possibility of confusion of species. We also measured several areas of each shell. We measured shell thickness with a Starrett Micrometer Caliper that was equipped with a constant-pressure screw and graduated in 10-micron units. With a magnifier, we attempted to estimate to the nearest micron. The accuracy of the instrument, checked against a standard as well as another instrument, was precise, and our reading accuracy fell easily within 5 microns. In this paper we have, for the first time in this series, converted all measurements to metric units.

Food samples, which we collected at the heronries, were often partially digested, and we preserved them as soon as possible in formaldehyde to halt decomposition. To determine size classes of the food specimens, we compared the undigested parts—most often the tails—with intact specimens. To estimate biomass, we used data compiled by Carlander (1950 and 1969) to convert fish length to weight.

In referring to colony locations, we have used the names found in published references to the sites, or the names of places (towns, lakes, etc.) closest to the colonies that can be found on the U.S. Geological Survey quadrangle maps. Our occasional references to hearing the migration of one species or another relate to a study made in central Illinois—mainly Champaign County—in which night sounds were recorded between the hours of 7:00 p.m. and 6:00 a.m. CST from 21 March to 1 June and from 17 August to 18 November 1957–1960 (Graber & Cochran 1959).

We are most particularly indebted to Frank C. Bellrose, who generously provided us with location and census data on many of the heron colonies of the Illinois and Mississippi rivers. John Schwegman and Alvin C. Lopinot permitted us to use unpublished data from their respective papers on heronries in southern Illinois, and Richard G. Bjorklund allowed us to use unpublished data from his studies on two Illinois River colonies. Dr. Bjorklund also reviewed the original manuscript of this paper.

A number of contributions of data from many sections of the state were made by staff of the Illinois Department of Conservation, including Conrad Foley, Walter Reeve, Jim Lockart, Floyd Kringer, Jared

Garver, Donald Siweck, Robert Cottingham, Jerry Schaefer, Charles Wahrenburg, David Klinedinst, Robert Williamson, John Stambaugh, and Herman Hier.

Peter Dring, Lawrence Balch, Harlan Walley, Jack Oar, Charles D. Hudson, Maryann Gossmann, Jerrold Olson, Mrs. Ed Laechelt, Robert Montgomery, Janet Tebussek, Charlie Swanson, and William Hartman provided valuable historical and other data on heron populations in northern Illinois. Marilyn Campbell, Dale Birkenholz, C. Turner Nearing, Richard Sandburg, Richard Palmer, Frank Irwin, James Funk, Mahlon Mahoney, Lynn McKeown, Darlene Friedmann, Louise Augustine, June and Russell Meece, Russell Mumford, and William H. Elder provided data on populations in central Illinois or adjacent areas. Paul Heye, Merrill McHenry, Richard Rodrian, Lucas Wischnik, Philip Short, James O. Smith, Lawrence Maedeker, Paul Roush, Denny Jones, Max D. Hutchison, and Michael Morrison provided data on southern Illinois or adjacent areas.

William L. Anderson (now with the Illinois Department of Conservation) and James W. Seets censused the Plainfield heronry and collected fish specimens for us there in 1973. They also explored four heronries by boat on the Mississippi River between St. Louis and Cairo and on the Wabash and Ohio rivers between Mt. Carmel and Paducah, Kentucky, in 1976.

The late George W. Bennett permitted us to use his fine photograph of a great blue heron, and William J. Beecher, his dramatic photograph of herons against the moon. We are also indebted to Robert Starr for permission to use his photographs of nesting snowy egrets and little blue herons and to Beverly Sanderson for the use of her drawing of a yellow-crowned night heron.

Several of our colleagues at the Illinois Natural History Survey provided valiant service in the identification of often badly mangled food specimens from herons. We are especially grateful to Larry Page, Brooks Burr, and Philip W. Smith for their work on the fishes and crayfish; Michael Morris, who identified toads and frogs; Don Webb, Wallace LaBerge, John Bouseman, and George Godfrey, who identified insects; and John Unzicker, who identified spiders and slugs.

Funds with which to search areas of the lower Mississippi River between St. Louis and Cairo were provided by the U.S. Army Corps of Engineers through a grant to Glen C. Sanderson. We are also indebted to Dr. Sanderson for editing the original manuscript and to Robert M. Zewadski, Technical Editor of the Illinois Natural History Survey, who edited the final manuscript for publication.



# GREAT BLUE HERON (*Ardea herodias*)

(Fig. 1 and 2)

## Spring Migration

Though great blue herons may be found in Illinois in winter, most of them migrate well to the south of Illinois and do not usually begin to reappear in the state until late February and March. February records may refer either to birds that have wintered in Illinois or to early spring arrivals (Brown 1964, Cooke 1913, Nolan 1958a). Lopinot (1950) recorded the first arrival of herons at a southern Illinois colony site on 23 February, and in northern Illinois great blues arrived at a colony on 19 March (Smith 1942a). Most of the Illinois breeding population probably returns in March (after 12 March) and April, with some more northern populations passing through the state even in May (Fig 3).

Because herons range so widely, there is the possibility of confusing local foraging flights with migration, and the characteristics of the migration are virtually unknown. Grasset (1926) saw seven birds take off from deep water near Glencoe on 4 April; he believed that they were migrating and had settled on

the water to rest (see also Keller 1966). In Vermilion County on 27 April 1977, William R. Edwards observed four great blues in a line formation fly over about dusk, moving directly north, but crabbing into a strong west wind. This may have been the beginning of a night migration. William J. Beecher photographed herons (possibly great blues) migrating at night as they crossed the light of the moon about 11 p.m. on 16 April 1976 at Chicago (Fig 4).

## Distribution

The great blue heron breeds throughout much of North America (Fig. 2). In Illinois nesting great blues are now found primarily on the major rivers (Fig. 5 and Table 1). A colony near Davenport was not plotted for lack of precise data on its location (Hodges 1954). There are records of colonies or isolated pairs on smaller streams (e.g., Timber Creek in McLean County, Calef 1953; Lusk Creek in Pope County, etc.), but there appear to be few such colonies left (Table 1). The absence of records for some major drainages, including the Little Wabash and Embarras rivers, both of which still have large areas of excellent-appearing habitat, is surprising. Also largely devoid of great blue heron breeding records are the Pecatonica, Rock, Green, upper Illinois (above Ottawa), Kankakee (in Illinois), both Vermilions, La Moine, and Sangamon rivers, most of which may have been ruined as heron habitat before they could be explored by ornithologists. The Kankakee drainage in Indiana supported extensive colonies in the last century (Butler 1897, Deane 1897), and the habitat east of Momence still looks suitable for herons. So far as we can determine, all of the northeastern Illinois colonies are gone. We would expect other great blue heron colonies to be discovered in the state, but at the rate that they are presently disappearing, if not found soon, they are likely to go undiscovered.

Great blues away from colonies may be found in all parts of the state in almost any month. Great blues were uncommon but usual items in Indian midden deposits throughout the state, constituting about 0.2 percent of identified bird remains and dating back to perhaps 2000 B.C. (Hill 1966, Parmalee 1957, 1962b, 1964, and 1969 and Parmalee et al. 1972).

## Nesting Habitats and Populations

Almost invariably great blue herons nest in bottomland forest habitat, usually within extensive tracts and not usually at the edge. The sizes of the nesting tracts for the 28 largest extant (or recently extant) great blue heron colonies in Illinois ranged from about 103 to 1,969 ha, with an average of 608 ha, a remarkably large area considering the de-

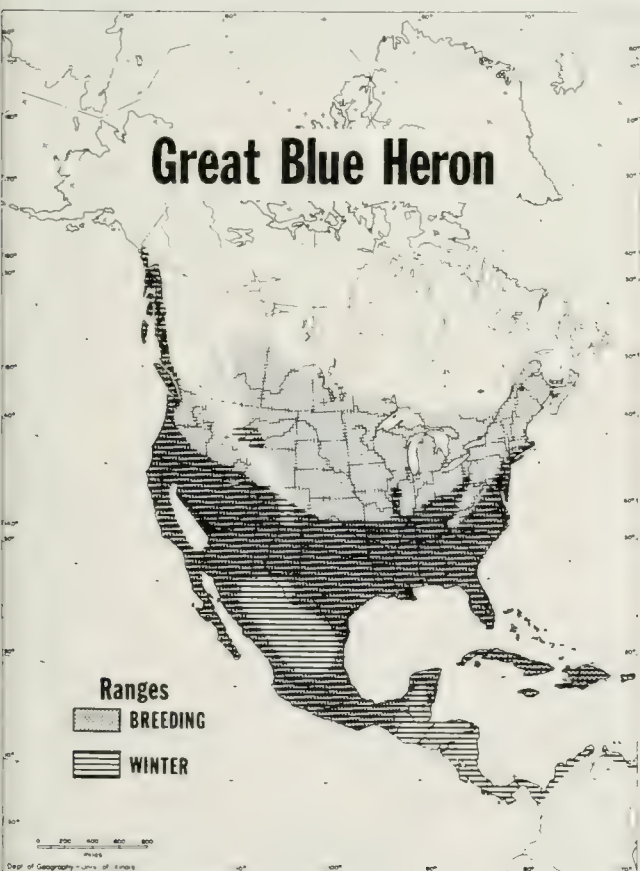


Fig. 2.—General distribution of the great blue heron.

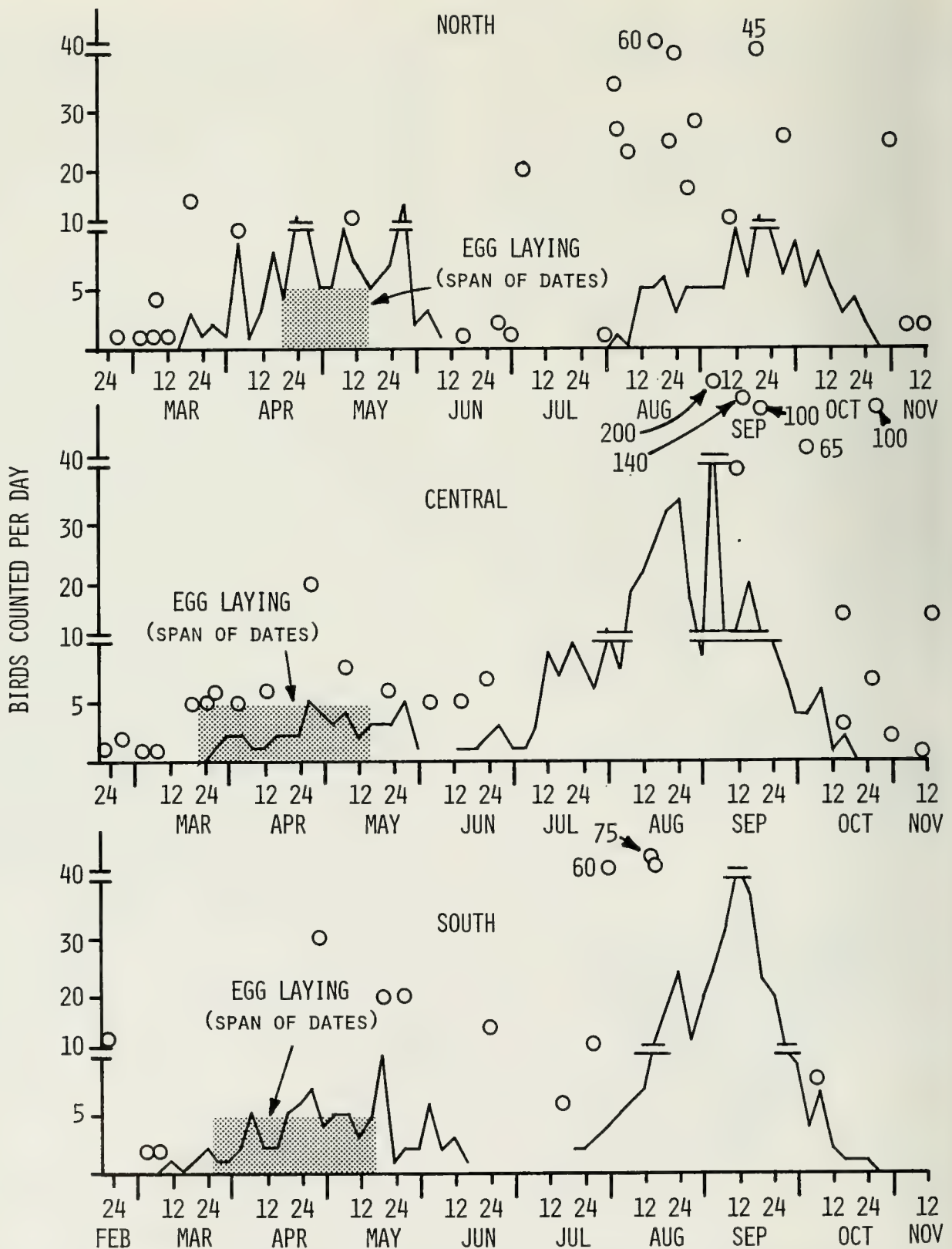


Fig. 3.—Egg-laying and migration seasons of the great blue heron in different regions of Illinois (see Fig. 7 for regions). Spring and fall graph lines show the highest daily count of each 4 days (1967–1970). Hollow circles represent counts made in other years or by other observers. Shaded areas show the span of dates during which egg laying has been recorded.





Fig. 4.—Migrating herons seen against the moon over Chicago at about 11:00 p.m., 16 April 1976, as photographed with a telephoto lens by William J. Beecher, Chicago Academy of Sciences.

gree to which lowland forest has been decimated in recent decades. The Clear Lake and Rend Lake colonies were excluded from this calculation for lack of data on tract size. Apparent exceptions to this use of large tracts for nesting were the colonies of north-eastern Illinois, some still present at least into the 1960's, at sites (Lake Forest, Barrington, McHenry, Belvidere, Cherry Valley) without extensive forests. However, most of these colonies were small and apparently have not survived, with the exception of the Chemung colony. The concealment value of an extensive tract may be important to colony survival. Most of the colonies are also over water during part or all of the nesting cycle, thus reducing accessibility to potential predators.

The nesting habitat is reflected in the kinds of nest trees used, generally typical floodplain species (Table 2). Lopinot (1950) recorded swamp cottonwood as the dominant nest tree at Crab Orchard Lake. Our counts indicate that the tree species most used by great blues are silver maple, sycamore, cottonwood, bald cypress, and tupelo, but there is regional variation in the species used. Elm (now virtually all dead) is a primary nest tree in northwestern Illinois, but nowhere else. Barnes (1909) implied that great blues showed a preference for sycamores and cottonwoods to elms of equal size. Sycamores are

not generally numerical dominants in lowland forests, but the species is second only to silver maple in its use by great blues. Silver maples and cottonwoods, on the other hand, are often dominants in bottomland forests. Oaks, hickories, willows, and ashes are also often dominants, but are relatively little used by great blues (Table 2). Hammerslough & Bjorklund (1968) and Bjorklund (1975) observed that cottonwood was the dominant nest tree for great blues at Pekin, whereas egrets made more use of silver maples, and night herons more use of green ashes.

Among the tree characteristics that great blues choose for nesting, size must be important. Though sycamores are not numerical dominants, they are often the largest trees in a stand. Most great blue nests are placed high in the largest available trees. Heights of great blue heron nests ranged from 14 to 29 m and averaged 21 m for all nest trees measured (Table 2). At Pekin great blue nests ranged in height from 18 to 24 m (Hammerslough & Bjorklund 1968).

The nest-site areas are only part of the essential breeding habitat. Aquatic foraging areas, which may lie outside as well as within forest areas, are essential. This foraging habitat has never been precisely defined either in physical terms or in terms of the

# Great Blue Heron

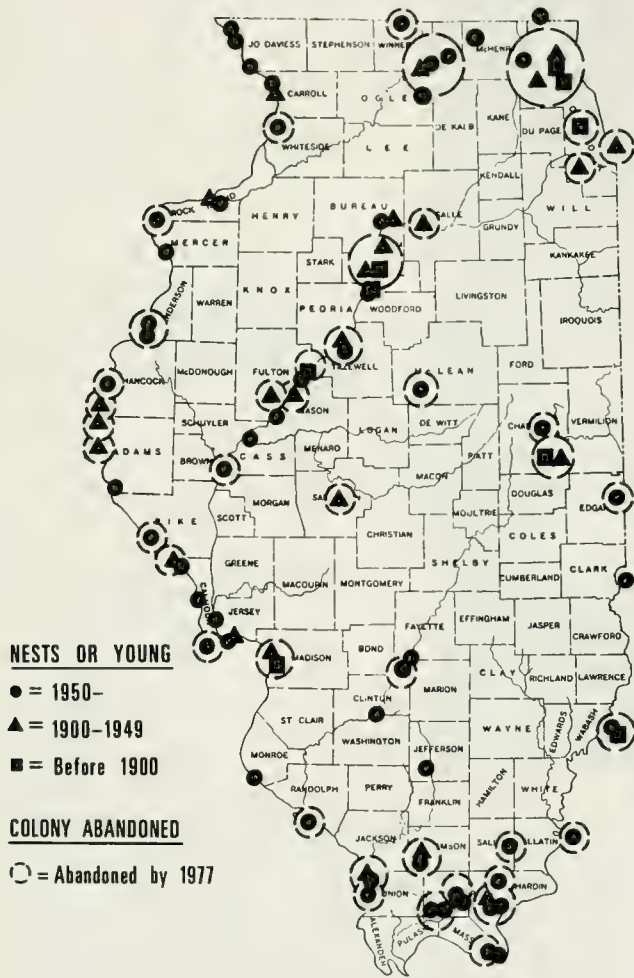


Fig. 5.—Distribution of nesting colonies of great blue herons in Illinois. Note that encircled colony sites were apparently abandoned as of 1976-1977.

fish populations it supports (see food). There is rough correlation between the nesting heron population and the amount of surface water available within a particular drainage. The correlation coefficient ( $r$ ) between numbers of heron nests and area of water surface for the 18 Illinois counties on the Mississippi River was 0.592 ( $P = < 0.01$ ). The foraging habitat is not that simply defined, however, as Johnson County, which has relatively little surface water, has a relatively high nesting population of great blues. Great blue populations might be better correlated with area of backwater, but acreage data are not available for that particular habitat. Backwaters are characteristic of the major Illinois rivers and of southern Illinois, which also constitute the primary nesting range of the great blue in Illinois. It is our impression that the great blue is particularly associated with the natural floodplain sequence in

which lagoons are filled by spring floods on major streams, dry back as summer progresses, and concentrate fish populations as the food requirements of nestling herons reach their peak.

Because great blue heron colonies are generally located in isolated areas, we expected the great blue population to be inversely correlated with the human population of a county. The relationship appeared to be negative ( $r = -0.229$ ) but was not significant. With one exception, however, the largest great blue colonies were in counties with less than 25,000 human inhabitants. Rock Island County and adjacent Iowa have over 265,000 people, and the large heron colony near Andalusia is presently declining. We know of no extant great blue colonies in the most populous counties (Cook, Lake, Du Page, Winnebago, Madison, St. Clair). One of the largest recently established colonies in the state was near Peoria, but it had declined to zero by 1974 (Bjorklund 1975).

Including bibliographic records dating back into the last century, some data exist on about 90 great blue heron colony sites in Illinois and adjacent areas (Table 1). Many of the published records are vague or very incomplete, and the number of colonies cannot be determined precisely. Barnes (1909) referred to a colony near Lacon which he believed had been in existence since the first settlement by whites. He personally had known of its existence since at least 1888, but the site was abandoned by 1909. Colony site(s) near Depue have been occupied since at least 1934 (Bartel 1934a and b). The relationship of the colony population to the colony site is unknown, and only extensive banding can show whether a given site is occupied every year by the same birds or their descendants, or what happens to the population when a site is deserted.

Of the 90 colonies on record, we know of only 34 that have been occupied since 1973, and 10 of these were deserted between 1973 and 1977. The loss of a colony site does not necessarily mean the loss of the population, however, and what happens to the birds when a colony site is abandoned is generally unknown. This lack of information, plus annual variation in the population and the difficulty of censusing colonies, makes any evaluation of long-term population change very difficult.

If, as an index, we refer to colonies for which there are both past and recent data on numbers of nests, there are indications of serious decline in the great blue heron population of Illinois. For the 25 colonies in this category, representing all regions of the state, the annual number of nests was 1,571 (using only the most conservative counts) before 1970, and 455 after 1970, a decline of 71 percent. There was about a 55-percent decline in nests at seven colonies between the 1960's and 1970's, including the loss of the Pekin colony studied by Bjorklund



Colony Site	County	Year	Number of Nests	Reference	Recent Counts of Nests						
					1973	1974	1975	1976	1977		
Mississippi River Area											
East Dubuque	Jo Daviess	1972	95	W. J. Hartman (unpublished)	...	70 <sup>a</sup>	90	40	20		
Menominee	Jo Daviess				...	5	5	20	...		
Savanna Depot	Jo Daviess				...	50	110	90	...		
Sabula, Iowa	Jackson				1942	P <sup>b</sup>	DuMont & Smith (1945)				
Sabula, Iowa	Jackson				1943	160 <sup>c</sup>	Harlan (1943, 1945)				
Sabula, Iowa	Jackson	1944	"Hundreds"	Harlan (1945)							
Sabula, Iowa	Jackson	1945			"Hundreds"						
Clinton	Whiteside	1966	50	W. H. Brown (1966), Petersen & Ward (1966)	...	0	0	0	...		
Davenport, Iowa	Scott	1890	4	Hodges (1954)							
Andalusia	Rock Island	1949	25 <sup>c</sup>	Hodges (1950)							
Andalusia	Rock Island	1950	Declined	Hodges (1951)							
Andalusia	Rock Island	1965	P	Brown (1965)							
Andalusia	Rock Island	1966	100 <sup>e</sup>	Petersen & Ward (1966), W. H. Brown (1966)							
Andalusia	Rock Island	1969	P	Brown (1969)	65	25	25	20	10		
Muscatine (south)	Mercer	?		Bellrose (unpublished)	...	0	0	0	...		
New Boston	Mercer	1955	250 <sup>e</sup>	Greer (1955)							
New Boston	Mercer	1956	400	Nolan (1957)							
New Boston	Mercer	1957	570	Nolan (1957)							
New Boston	Mercer	1958	P	Nolan (1958 <i>b</i> )							
New Boston	Mercer	1959	P	Mumford (1959)							
New Boston	Mercer	1962	135 <sup>c</sup>	Brown (1962)							
New Boston	Mercer	1963	50	Brown (1963 <i>b</i> )							
New Boston	Mercer	1965	P	Greer (1966)	10	45	35	25	45		
Burlington, Iowa, Skunk River	Des Moines				20	40	5	0	...		
Lomax	Henderson				...	5	0	0	...		
Keokuk, Iowa, Des Moines River	Lee			Bellrose (unpublished)	0	0	0	0	...		
Taylor Island	Hancock	1937?	80	Angus (1937)	0	0	0	0	...		
Long Island	Adams	1937?	20	Angus (1937)	0	0	0	0	...		
Shandrew Island	Adams	1925	14	Musselman (1926)	0	0	0	0	...		
Lima Lake	Adams	1932?	50	Musselman (1932 <i>b</i> )	0	0	0	0	...		
McDonald Island	Adams					35	45	30	25	...	
Boyd Island	Pike				...	25	10	0	...		
Atlas	Pike	1948	50	Musselman (unpublished)	0	0	0	0	...		
Clarksville (north), Mo.	Pike	1941	P	Jenkins (1942)	0	0	0	0	...		
Clarksville (north), Mo.	Pike	1942	P	Jenkins (1942)							
Clarksville (south)	Calhoun	1942	40	Cunningham & Spotswood (1942)							
Clarksville (south)	Calhoun	1945	100	Cunningham (1945)	120	80	45	30	50		
Clarksville (south)	Calhoun	1951	P	Anonymous (1951)	100	40	60	35	50		
Hamburg	Calhoun				...	...	60	0	...		
Old Monroe, Mo.	St. Charles				...	...	0	0	...		
Grafton No. 1	Jersey	1939	22	Jones (1939 <i>a</i> )	0	0	0	0	...		
Grafton No. 2, Mo.	St. Charles				0	0	0	3	...		

(Table 1 continued on next page.)

TABLE 1.—Continued

Colony Site	County	Year	Number of Nests	Reference	Recent Counts of Nests				
					1973	1974	1975	1976	1977
Alton	?	1941	6	Cunningham (1941)	0	0	0	0	...
Fults	Monroe		P	Fleig (1971)	35	60	20	15	10
Kaskaskia	Randolph				0	0	0	10	0
Wolf Lake, Big Muddy River	Union	Late 1940's	P	J. Schwegman (unpublished)					
Wolf Lake, Big Muddy River	Union	1950	213	Lopinot (1950)					
Wolf Lake, Big Muddy River	Union	1969	0	J. Schwegman (unpublished)	0	0	0	0	...
Ware	Union	About 1970	Colony started		30	60	45	30	0
Illinois and Spoon River Areas									
Starved Rock	La Salle	1944	P	Bellrose (unpublished), Ries & Werner (1946)	...	...	...	0	0
Depue	Bureau	1934	P	Bartel (1934a and b)					
Depue	Bureau	1936	400	Bellrose (1938)					
Depue	Bureau	1947	300	Bellrose (unpublished), DuMont (1947b)					
Depue	Bureau	1958	250	Bellrose (unpublished)					
Depue	Bureau	1962	250	Bellrose (unpublished)					
Depue	Bureau	1964	75	Bellrose (unpublished)					
Depue	Bureau	1967	150	Bellrose (unpublished)	20	30	45	40	40
Hennepin	Putnam	1939	P	Bellrose (1939b)	0	0	0	0	...
Lake Senachwine	Putnam	1936	50	Angus (1937)	0	0	0	0	...
Henry	Putnam	1939	68	Bellrose (unpublished)					
Sparland	Marshall	1958	60	Bellrose (unpublished)					
Sparland	Marshall	1962	0	Bellrose (unpublished)					
Sparland	Marshall	1964	0	Bellrose (unpublished)					
Lacon	Marshall	Since first settlement	P	Barnes (1909)	0	0	0	0	...
Lacon	Marshall	1888	42	Barnes (1909)					
Lacon	Marshall	1900	47	Barnes (1909)					
Lacon	Marshall	1904	67	Barnes (1909)					
Lacon	Marshall	1909	0	Barnes (1909)	0	0	0	0	...
Lacon No. 2	Marshall	1912	24	Barnes (1912)	0	0	0	0	...
Lacon No. 3	Marshall	1927	120	Barnes (1927)	0	0	0	0	...
Lacon No. 3(?)	Marshall	1936	50	Bellrose (unpublished)					
Lacon	Marshall	1939	4	Bellrose (unpublished)	0	0	0	0	...
South Marshall County	Marshall	1890	P	Barnes (1890b)					
South Marshall County	Marshall	1936	P	Barnes (1936)	0	0	0	0	...
Chillicothe (East Douglas)	Marshall	1891	P	W. E. Loucks (unpublished)	...	0	0	0	...
Chillicothe (north)	Peoria	1968	107	Bellrose (unpublished)	...	40	20	25	20
Chillicothe (north)	Peoria	1971	56	Bellrose (unpublished)					
Pekin	Tazewell	1935	P	Bjorklund (1975)					
Pekin	Tazewell	1958	125	Bellrose (unpublished)					
Pekin	Tazewell	1962	279	Bjorklund (1975)					
Pekin	Tazewell	1972	41	Bjorklund (1975)	7	0	0	0	0
Spring Lake	Tazewell	1891	P	W. E. Loucks (unpublished)	...	0	0	0	0

(Table 1 continued on next page.)



Colony Site	County	Year	Number of Nests	Reference	Recent Counts of Nests				
					1973	1974	1975	1976	1977
Big Lake (Duck Island)	Fulton	1933?	P	Angus (1937)					
Big Lake (Duck Island)	Fulton	1938	70	Bellrose (1939b)					
Big Lake (Duck Island)	Fulton	1939	114	Bellrose (unpublished)	...	0	0	0	0
Clear Lake	Mason-Tazewell	1958	0	Bellrose (unpublished)					
Clear Lake	Mason-Tazewell	1962	110	Bjorklund (unpublished)					
Clear Lake	Mason-Tazewell	1964	100	Bjorklund (unpublished)					
Clear Lake	Mason-Tazewell	1967	140	Bjorklund (unpublished)					
Clear Lake	Mason-Tazewell	1968	278	Bjorklund (unpublished)					
Clear Lake	Mason-Tazewell	1969	293	Bjorklund (unpublished)					
Clear Lake	Mason-Tazewell	1971	141	Bjorklund (unpublished)	118	...	62	...	95
Clear Lake	Mason	1942	7	Smith (1942b)					
Lake Chautauqua	Mason	1944	12	Smith & DuMont (1944)	...	0	0	0	...
Lake Chautauqua	Fulton	19??	P	Strode (1917)					
Lewistown, Spoon River	Fulton	2 years later	0	Strode (1917)					
Grand Island	Mason				P	...	55	50	65
Stewart Lake (upper point)	Mason	1939	80	Bellrose (unpublished)					
Stewart Lake (upper point)	Mason	1958	250	Bellrose (unpublished)					
Stewart Lake (upper point)	Mason	1962	0	Bellrose (unpublished)	...	...	0	0	0
Sanganois	Cass	1969	P	Bellrose (unpublished)					
Sanganois	Cass	1970	P	Bellrose (unpublished)	...	...	0	0	0
Lake Meredosia	Cass	1958	90	Bellrose (unpublished)					
Lake Meredosia	Cass	1962	100	Bellrose (unpublished)					
Lake Meredosia	Cass	1964	150	Bellrose (unpublished)	P	0	0	0	0
Lake Meredosia	Cass	1967	115	Bellrose (unpublished)	...	...	30	10	0
Nutwood	Calhoun								
Areas Other Than Mississippi and Illinois Rivers									
Beloit, Sugar River	Winnebago	1965	12	Mrs. Ed Lachelt (unpublished)	...	...	...	...	0
Roscoe, Kinnikinuck Creek	Winnebago-Boone	?	P	J. Oar (unpublished)					
Rockford, Kishwaukee River	Winnebago	1947	29	DuMont (1947b)					
Rockford, Kishwaukee River	Winnebago	1959	34	Mumford (1959)					
Cherry Valley, Kishwaukee River	Winnebago	1958	25	Johnson (unpublished)					
Cherry Valley, Kishwaukee River	Winnebago	About 1967	P	J. Oar (unpublished)	...	...	...	...	0
Lindenwood, Killbuck Creek	Ogle								
Belvidere, Piscasaw Creek, Kishwaukee River	Boone	1966 or 1967	30	C. Swanson (unpublished)	...	...	...	...	P
Chemung, Piscasaw Creek	McHenry			J. Oar (unpublished)	...	...	...	...	0
Hartland, Kishwaukee River	McHenry	1964-1967	P (4 years)	C. D. Hudson (unpublished)	...	...	...	...	P
Antioch (north in adjacent Wisconsin)	Kenosha	1956	17	Williams (1957)					
McHenry, Fox River	McHenry	1957	1	Fawks (1967b)					
McHenry, Fox River	McHenry	1967	30	Fawks (1967b)					
Barrening, Fox River	Lake-Cook	1949	1	Ford (1956)	...	...	...	...	0
Half Day, Des Plaines River	Lake	1932	20	Ford et al. (1934)					

(Table 1 continued on next page.)

TABLE 1.—Continued

Colony Site	County	Year	Number of Nests	Reference	Recent Counts of Nests				
					1973	1974	1975	1976	1977
Upper Des Plaines River	Lake	1932	15	Ford (1932)					
Upper Des Plaines River	Lake	1933	14	Sanborn (1935b), Ford (1956)					
Upper Des Plaines River	Lake	1934	25	Sanborn (1935b)					0
Upper Des Plaines River	Lake	1935	38	Sanborn (1935b)					0
Upper Des Plaines River	Lake	1941	22	Smith (1941)					0
Upper Des Plaines River	Lake	1949	8	Ford (1956)	...	...	...	...	...
Wheeling, Des Plaines River	Cook	1889	P	Gault (unpublished)	...	...	...	...	...
River Forest, Des Plaines River	Cook	1888	P	Gault (unpublished)	...	...	...	...	...
Deerfield, Chicago River	Lake	1899	14	Gault (unpublished)	...	...	...	...	...
Jackson Park, Lake Michigan	Cook	About 1940	1	Nice (1952)	...	...	...	...	...
Orland Park, Des Plaines River	Cook	?	P	Coursen (1947)					
Willow Slough, Indiana	Newton	1953	P	Nolan (1954b)					
Willow Slough, Indiana	Newton	1959	0	Mumford (unpublished)					
Funks Grove, Timber Creek	McLean	1951	3	Calef (1953)					
Urbana, Salt Fork	Champaign	1958	1	Kendeigh & West (1958)					0
Philo, Embarras River	Champaign	1897	P	Hess (1910)	...	...	...	...	...
Lake Springfield, Sangamon River	Sangamon	?	P	Eifert (1949)	...	...	...	...	...
Brouillets Creek, Wabash River	Edgar	About 1971	10	C. Foley (unpublished)	0	...	...	0	...
Hutton, Ind., Wabash River—	Vigo				...	...	...	20	...
Mt. Carmel, Wabash River	?	1875?	P	Nelson (1877)					
East Mt. Carmel, Ind., White River	Knox				...	...	...	7	0
Hovey Lake, Ind., Wabash & Ohio rivers	Posey	1950	100	Skaar (1951)	...	...	...	0	...
Equality, Saline River	Saline				6	4	1	0	...
Little Lusk Creek, Lusk Creek	Pope	1957	5	J. Schwegman (unpublished)					
Little Lusk Creek, Lusk Creek	Pope	By 1960	0	J. Schwegman (unpublished)					
Flick Branch, Lusk Creek	Pope	1967	6						
Golconda, Lusk Creek	Pope	1970	0						
Golconda, Lusk Creek	Pope	1946		L. Maedeker (unpublished)					
Grantsburg, Bay Creek	Pope	1969	33	J. Schwegman (unpublished)	30	35	20	20	0
Grantsburg, Bay Creek	Pope	1966	P	J. Schwegman (unpublished)	0	0	0	0	...
Grantsburg No. 2, Bay Creek	Johnson	1969	0	J. Schwegman (unpublished)	...	0	10	45	45
West Vienna, Cache River	Johnson	1969	P	J. Schwegman (unpublished)	...	...	P	15	P
Heron Pond, Forman, Cache River	Johnson	1954	P	J. Schwegman (unpublished)					
Heron Pond, Forman, Cache River	Johnson	1969	54	J. Schwegman (unpublished)	70	0	0	0	...
Unionville, Ohio River	Massac	1950's	P	J. Schwegman (unpublished)					
Unionville, Ohio River	Massac	1966	15	J. Schwegman (unpublished)					
Unionville No. 2, Ohio River	Massac	1968	6	J. Schwegman (unpublished)					
Shobonier, Kaskaskia River	Fayette								
Upper Carlyle Reservoir	Fayette	1972	56	M. McHenry (unpublished)					
Crooked Creek, Kaskaskia River	Clinton				P	100	80	40	35
Rend Lake	Jefferson				135	70	20	10	15
Crab Orchard Lake, Little Grassy Creek	Williamson	1945	P	Bennett (1953)	0	0	0	0	...
Crab Orchard Lake, Little Grassy Creek	Williamson	1948	134	Lopinot (1950)	120	80	20	15	...
					15	25	30	15	...

(Table 1 continued on next page.)



TABLE 1.—Continued

Colony Site	County	Year	Number of Nests	Reference	Recent Counts of Nests			
					1973	1974	1975	1976 1977
Crab Orchard Lake, Little Grassy Creek	Williamson	1949	110	Lopinot (1950)				
Crab Orchard Lake, Little Grassy Creek	Williamson	1950	76	Lopinot (1950)				
Crab Orchard Lake, Little Grassy Creek	Williamson	1951	59	Bennett (1953)				
Crab Orchard Lake, Little Grassy Creek	Williamson	1952	36	Bennett (1953)				0
Number of nests counted, 1973–1976					929	1,004	1,053	770
Number of colonies in which great blue herons were counted					16	22	26	26
(excludes colonies counted but once)								
Colonies not censused in year indicated					10	4	0	1
Estimated number of nests uncouncted (highest available count of closest year)					505	263	0	95
Estimated total number of nests (to nearest 5)					1,435	1,265	1,055	865

<sup>a</sup> Counts above 5 rounded to nearest 5 (our data only).<sup>b</sup> Nests present but not counted.<sup>c</sup> Number calculated from author's data.

(1975). The 25 colonies that we censused each year between 1974 and 1976 showed a decline of 39 percent (Table 1). Though nearly every colony declined some, the Savanna Depot and Sabula colonies in northwestern Illinois appeared to be the most stable, while southern Illinois colonies declined much more (64 percent, 1974–1976). In Table 1 we have attempted to estimate the statewide population of great blue heron nests from 1973 to 1976, using for the counts that we lacked data from the counts made closest in time. The annual figures indicate a progressive loss of 12–18 percent per year. Such a progressive change is unexpected. Bellrose (*in* Mills et al. 1966) found the number of great blue heron nests in the middle Illinois valley to be extremely variable—775 in 1958, 1,140 in 1962, and 385 in 1964. The same area produced about 235 nests in 1973–1974, and 190 in 1975–1976, i.e., it showed the same trend as did the entire state.

The causes of the declines cannot be determined precisely without more detailed study on the ecology of the birds. Human activity could hardly be more destructive to heron populations if that were the goal. Agricultural pursuits cause complete deforestation of large areas as well as the draining of the herons' foraging areas. Foresters, who make a practice of cutting the largest trees, effectively select against the great blue, which nests selectively in the largest trees. The cutting of heronry sites has been recorded by Barnes (1927) in Marshall County, Bjorklund (1975) in Tazewell County, Schwegman (unpublished 1969) in Massac County, and by us (1976) in Union County. Flooding, which kills the nest trees, also ultimately eliminates the colony site (Barnes 1909). Deane (1897), Strode (1917), Musselman (1926), Angus (1937), and Jenkins (1942) reported colonies being "shot up," and some ignorant people still pursue this practice though it is strictly illegal. At the Lusk Creek heronry in 1973 we found cartridge cases and dead young. Such shooting may cause the abandonment of the heronry (Strode 1917, Musselman 1926), but colonies sometimes survive (Mumford 1959), an indication of the birds' tenacity in remaining at a good site. Colonies on the upper Kankakee drainage survived for years even though they were exploited by plume hunters (Deane 1897).

Besides deliberate vandalism, other human disturbance may be important. Herons require relatively undisturbed fishing as well as nesting areas, and the human populace flocks to the waterways in summer, when the demand for food for the young herons is greatest. Human intrusion at colonies also causes the young to lose food through their action of disgorging when the colony is disturbed (Harlan 1943).

Destruction of great blue heron nests by windstorms is apparently not uncommon (Bartel 1934b, Bennett 1953, Nolan 1958b), the weight of the large



TABLE 2.—Nest trees of great blue herons in Illinois.

Species	Number Identified	Percent	Tree Size (DBH in cm)			Nest Height in Meters		
			Number	Range	Mean	Number	Range	Mean
Silver maple ( <i>Acer saccharinum</i> )	64	20.5	32	38–147	66	12	17–23	20
Sycamore ( <i>Platanus occidentalis</i> )	49	15.7	25	61–157	86	43	17–27	22
Cottonwood ( <i>Populus deltoides</i> )	48	15.4	10	48– 94	63	6	21–29	25
Dead trees, mainly elms ( <i>Ulmus</i> )	42	13.5	8	38–102	63	18	14–20	17
Bald cypress ( <i>Taxodium distichum</i> )	34	10.9	17	33–135	66	13	18–27	23
Tupelo gum ( <i>Nyssa aquatica</i> )	32	10.3	29	25–122	58	47	15–29	23
Oaks ( <i>Quercus palustris</i> , <i>Q. lyrata</i> , <i>Q. macrocarpa</i> )	18	5.8	2	48– 84	66	3	17–20	18
Black willow ( <i>Salix nigra</i> )	9	2.9	9	38– 58	46	9	15–23	18
Green ash ( <i>Fraxinus pennsylvanica</i> )	5	1.6	2	43– 58	51	1	...	18
Honey locust ( <i>Gleditsia triacanthos</i> )	4	1.3	3	33– 71	46	5	18–21	19
Swamp cottonwood ( <i>Populus heterophylla</i> )	2	0.6	2	36– 51	43	2	18–21	20
River birch ( <i>Betula nigra</i> )	2	0.6	..	...	..	..	...	..
Hickory ( <i>Carya</i> sp.)	2	0.6	1	...	58	1	...	20
Box elder ( <i>Acer negundo</i> )	1	0.3	1	...	56	2	14–15	14
<i>Total</i>	312	100.0	141			162		
<i>Mean of means</i>					66			21

nests probably being a contributing factor, but no instance of colony abandonment has been recorded because of wind. Strangely, the weight of great blue nests has not been measured. A windstorm in late June 1974 did extensive damage to colonies in northwestern Illinois. About one-fourth of the nests were destroyed at East Dubuque and New Boston and over one-third at Sabula, killing the young birds, which were more than half grown. The Sabula colony was also decimated by wind in 1943 (Harlan 1943). Wind protection may be a factor in the location of colonies within extensive tracts of timber. Of the 24 colonies we visited, 1973–1975, 9 had obviously lost nests to windstorms.

There are few data relating to the effects of pollution on great blue heron populations in Illinois. A moribund great blue found near Harvard in June 1977 contained high levels of organochlorine residues—12 ppm of dieldrin in the brain (Andrea Kane unpublished). Our preliminary data on egg-shell thickness suggest that herons may be victims of hydrocarbon pollution. We took 5–10 measurements of shell thickness on each of 11 great blue heron eggs from two colonies (Clarksville, which had great blues only, and Hamburg, which had great blues and great egrets) on the Mississippi River (see introduction). The shells appeared to be from hatched eggs. The range of shell thickness (62 measurements) was 244–360 microns, with an overall mean of 312 (SE = 3.60). The average shell thickness at Hamburg was 330 microns (SE = 3.0), and at Clarksville, 302 (SE = 4.57). Average shell thickness for pre-1947 eggs of great blues, presented by Faber et al. (1972), was 396 microns. The Illinois eggs were also thinner than recently hatched or broken eggs of California birds (range of means: 328–365, Faber et al. 1972). Within the same cross-sectional perimeter of an egg, we found shell thickness to be very constant (range: 331–334 microns, mean: 332.2, SE: 0.49), but thickness var-

ied much more along the length of a different egg (range: 274–309 microns, mean: 292.7, SE: 4.93). The pre-1947 eggs were probably oological specimens and probably mainly fresh specimens, as oologists consciously tried to get fresh eggs. We would expect fresh eggs to have thicker shells than hatched eggs due to wear and absorption. The amount of loss in shell thickness during incubation is apparently unknown, but needs to be determined before the full extent of shell loss from pollution can be determined. A special study is needed on the whole problem of shell thinning and productivity in Illinois herons.

If we are to conserve the remnant nesting population of great blues in Illinois, every effort should be made to protect both the colony sites and the fishing areas, even to the point of eliminating human traffic in those areas during the breeding and migration seasons. It is important to locate the major fishing areas for each colony. The problem of determining population trends of the herons is the problem of conducting studies that are both intensive and extensive in terms of area (hundreds of square miles) and time (20 years or more). The natural oscillations of any population are generally unknown, and the abandonment of a colony site cannot be assumed to be either a change of nesting locale or a population loss.

### Nesting Cycle

If any type of "song" accompanies courtship of Illinois great blue herons, it has not been described. The only calls we have heard are the loud, raucous, croaking notes of birds disturbed at their fishing grounds, or colony, and the begging noises of the young. Upon arrival from the winter range, great blues go almost immediately to the nesting colony. Arrival dates at the colony are as early as arrival dates to the area (Smith 1942a, Sanborn 1943a, Lopinot 1950, Brown 1974). Yearling birds are not

believed to breed (Bent 1926), but there are no Illinois data on the question of where these birds go or what they do. Much of what is known about the nesting cycle of the great blue in Illinois comes from the study of Lopinot (1950) at the Crab Orchard Lake heronry. He observed interesting courtship displays, involving mutual preening by the paired birds, and copulation at or near the nests, which ranged in height from 12 to 18 m. Many of the nests, large stick structures, are reused and added to each year (Barnes 1909). At Crab Orchard both members of the pair brought sticks to the nest, and old nests (of previous years) were the first sites to be occupied. At Sabula great blues were building on 26 March (Anonymous 1977). Four fallen but reasonably intact nests which we measured at East Dubuque and Carlyle Lake averaged 81 cm in diameter by 36 cm deep (outside). The time requirement for nest construction, or reconstruction, has not been recorded, but Lopinot's (1950) study indicated a time lapse of nearly a month between the arrival of the birds to the colony and the onset of laying. Distribution of nests varies from one per tree to as many as 32 per tree (the highest number we have seen) with intermediate observations of 9, 11, and 19 per tree (Nelson 1877, Angus 1937, Barnes 1909). Angus (1937) considered two to five nests to be the usual number.

At Crab Orchard a great blue first began sitting on its nest on 18 March, but Lopinot did not see the first egg until 25 March. Near Pekin, Bjorklund (unpublished) recovered a great blue egg as early as 21 March. Precise laying dates are not available for any other colony, but Musselman (1933) reported great blue eggs hatching by 2 May, indicating egg laying by about 4 April near Quincy. At Lake Forest, Smith (1941) recorded fledging of young by 5 July, indicating laying by about 15 April. Also in the north Barnes (1909) reported fresh eggs 2–6 May. Although the span of egg laying for most nests within a colony may be relatively short (i.e., about 10 days, according to Lopinot's observations), not all nests are so closely synchronized in laying, and annual variation also expands the laying season. Thus, 1973 appeared to be a late year for some colonies, and 1975, early. Judging from early egg dates and the latest dates when we've observed fledging, the egg laying season for great blues in Illinois extends from about 25 March to 17 May.

The eggs are unmarked, pale blue or greenish. There are no very recent data on clutch size. Fourteen sets of eggs collected in the last century in northern and central Illinois by R. M. Barnes and Isaac Hess had the following distribution of clutches: 6 eggs—two sets, 5 eggs—six, and 4 eggs—six. Elsewhere, Barnes (1909) stated that clutches ranged from 3 to 6 eggs. At Crab Orchard, Lopinot (1950) observed that most nests received 4 eggs, some 3. It is apparently unknown whether eggs are laid on con-

secutive days. Lopinot (1950) observed a great blue sitting on its nest even before the eggs were laid, and incubation probably starts with the first egg. Both adults incubated the eggs, and the exchange of birds on the nest took place "several times" during the day.

Lopinot (1950) found the incubation period to be 29 days from the laying of the first egg on 25 March to the hatching of the first young on 23 April. This observation is in close agreement with the figure (28 days) given by Bent (1926). At a Lake County heronry, Gault (unpublished 1889) observed herons standing on branches near the nests while their presumed mates incubated the eggs.

Lopinot observed that the young were brooded for about a week after hatching and that both adults brought food to the nest, the first food being very small fish about 5 cm in length. When they brought food, the adults engaged in a kind of pumping action of the throat to bring the food up, then regurgitated several fish at a time into the nest. The adults cast up fish two to three times during a visit, then sometimes reingested food that the young did not eat. Feeding rates were highest at about 6 a.m. and 5 p.m. Especially when adults bring food, the young can be very noisy, uttering a kind of gabbling sound that makes a colony audible a kilometer away.

At 3 weeks of age, the young stand erect in the nest, and at about 5 weeks they begin to walk about on the limbs of the nest tree. At 7 weeks they begin to fly short distances. Lopinot (1950) first observed regurgitation by the young, as a reaction to disturbance, at about 6 weeks of age.

Scattered observations indicate the progression of the nesting cycle. Lopinot (1950) observed that most great blues, adults as well as young, had left the Crab Orchard colony by 11 July. In central Illinois, Musselman (1933) reported young crawling out of the nest on 9 June 1932. In northern Illinois young great blues have been reported able to stand in the nest by 12 May (Barnes 1927), not quite ready to fledge by 17 June (Bartel 1934a), ready to fledge by 18 June (Ford et al. 1934), and mostly fledged by 26 June with a few still present in nests in mid-July (Ford 1932 and 1956). We have seen a few young still in nests as late as 1 August (1973) in both northern and southern Illinois.

Our counts of young indicate a somewhat later ending of the cycle than the above observations (Table 3), with about one-half of southern Illinois nests fledged by 5 July and nearly three-fourths by 16 July, while in northern Illinois about two-thirds of the nests were fledged by 22 July. Many of our data were collected in 1973, a year in which nesting appeared to be late, possibly because of unprecedentedly high flooding in the Mississippi Valley.

There are no published data on nesting success or productivity for any great blue heron colony in Illinois. Such data are difficult to acquire, the nests be-



TABLE 3.—Number of great blue heron nests with young, by date of observation.

Region of Illinois and Date	Nests with 1 Young	Percent with 1	Nests with 2 Young	Percent with 2	Nests with 3 Young	Percent with 3	Nests with 4 Young	Percent with 4	Total Young	Total Nests with Young	Young per Occupied Nest	Percent of Nests Vacated
North and Central												
29 June–10 July	15	30.0	15	30.0	8	16.0	12	24.0	117	50	2.3	
14–15 July	16	53.3	9	30.0	5	16.7	0	0	49	30	1.6	36.2
22 July	11	61.1	3	16.7	2	11.1	2	11.1	31	18	1.7	62.3
Total or mean									197	98	2.0	
South												
20 May–23 June	10	25.0	10	25.0	9	22.5	11	27.5	101	40	2.5	
1–5 July	8	29.6	10	37.0	7	25.9	2	7.4	57	27	2.1	42.5
9–10 July	8	40.0	5	25.0	4	20.0	3	15.0	42	20	2.1	
16 July	10	62.5	2	12.5	4	25.0	0	0	26	16	1.6	72.4
Total or mean									226	103	2.2	

ing hard to reach for the purpose of determining clutch size and hatching and fledging success. Also, fairly continuous surveillance is needed to determine accurately the number of young fledged. Precise data on productivity are badly needed to interpret population changes (see below under Mortality). During our censuses of colonies we made counts of large young per nest (Table 3). However, such counts are not a true measure of productivity, as they err on the one side by not including nesting attempts that produced no young or nests that failed after our visit, and on the other by missing young that fledged before our visit. It can be seen (Table 3) that our highest average counts—2.3 young per nest in north and central Illinois and 2.5 per nest in southern Illinois—were observed relatively early in July or in June and declined as the weeks passed. The decline probably represented the fledging (or mortality) of young. These figures exclude nests in which we could see no young. Coincidentally, the number of empty nests and nests with one young increased as the number with three and four young declined. DuMont (1947b) reported that 29 nests in the Rockford area averaged three young per nest, but their ages were not stated.

Causes of nest failure, other than human vandals and the windstorms noted above, are generally unknown. We saw no evidence of renesting following the severe wind damage of 1974. Bjorklund (1975) suspected that nesting success declined at the Pekin colony as the area was opened up by timber cutters. Great blue herons are formidable adversaries for would-be predators. Musselman (1933) observed great blues repulse an apparent attack on a heron colony by a bald eagle, and we have witnessed a similar event involving a red-tailed hawk. Horned owls sometimes nest in great blue heron colonies (Lopinot 1950, Bjorklund et al. 1967) and may prey upon the herons, but the actual effect on either species is unknown. We have seen both turkey and black vultures at heron colonies, often perched in the nest trees, but

their effect on the colony, if any, is unknown (see also Greer 1955). Lopinot (1950) observed a raccoon feeding on a young heron in a nest, but this may have been a case of carrion feeding. In *Ardea cinerea*, Owen (1959–1960) found that starvation was a common cause of mortality and that the youngest birds of the brood were most likely to succumb. Because incubation starts with the first egg, the ages of the nestlings are staggered.

The only Illinois reference we have found on diseases or parasites is that of Shoop (1931) on an infestation of the fluke, *Clinostomum*, in one specimen.

### Fall Migration

Following the nesting season, at least some great blue herons move northward before migrating south. Bartel's (1937 and 1976) banding studies once again provide especially fine data on the movements of a species. Apparently no adult great blues have been banded in Illinois. Recoveries of young great blues that Bartel banded at the Depue colony in June and July from 1933 to 1939 show the northward dispersal in late summer and fall (Fig. 6). Of the 29 recoveries of immatures, 10 were from localities (Wisconsin and northern Illinois) north of the colony. Six of these recoveries were obtained in the same year as banding, and their dates ranged from 18 July to 19 October (one indirect recovery in the north was as late as 26 October), but most of these northern recoveries came in July and August. Five recoveries were from near the colony site. Thirteen of the recoveries were from latitudes south of the colony. Five of these birds were recovered in the same year as banding on dates from 19 September to 30 November. Only one midsummer (29 July) recovery was made south of the colony, and that barely south (Rensselaer, Indiana). These records show a pattern of northward dispersal in July and August, after the nesting season, with some birds lingering in the north even late in October. The southward migration occurs in September and October, coinciding with the



Fig. 6.—Direct and indirect recoveries of great blue herons banded as nestlings in Illinois, with months of recovery north and south of the state indicated.

regular seasonal decline (Fig. 3). Bjorklund & Canterbury (1971) record a recovery from Tabasco, Mexico, by 1 November.

Though the orientation of the late summer flights is widely spread from east-northeast to west-northwest, the virtual absence of July-August recoveries from south of the colony implies that these early flights have a definite orientation northward, rather than to all points of the compass. The sample, however, is small though it represents a large amount of work (at least 445 great blue herons banded). Little else is known of the northward flights in fall—what stimulates them, whether they are made in short hops or one long diurnal (nocturnal?) flight, whether a given population has a specific orientation, and other details. The most northern recovery from Bartel's (1935 and 1976) studies was about 434 km from the banding site (Fig. 6).

What brings the birds back to southward orientation is unknown. Angus (1937) observed what was apparently the onset of a southward migration along the Mississippi River near sunset on 22 October 1935. The birds flew in eight small flocks of 2–16 birds each in V or line formation, calling as they went. These migrating birds appeared to stimulate great blues on the ground to rise and join the flight. Muselman (1937) also refers to great blues migrating southward in V formation on 26 August, the earliest observation of actual fall migration. Angus's (1937) reference to a departure of great blues at sunset is revealing also as an indication of nocturnal migration,

as is a specimen killed at a television tower near Orion, Illinois, on the night of 6–7 October 1959 (Petersen 1959). We heard great blues flying and calling on the night of 18–19 October 1959 at 11:15 p.m. and 2:05 a.m. CST at Havana.

Although most of the great blue heron population has left Illinois by the end of October (Fig. 3), in some years a few birds may linger even in the north well into November and even December (Work 1934–1935, Boulton & Beecher 1940, Nelson 1876–1877, Balch 1972). Coursen (1947) observed that few birds remain at Orland until the marshes freeze. On the Illinois and Mississippi rivers as many as 150 great blues have been seen in early December (Mumford 1960b) and 29 were seen on 30 December (Hamilton 1968), but such late concentrations are unusual. They presumably represent the winter population. The source of these late birds is unknown.

We have found but one reference to the late summer-fall roosting behavior of great blues. Franzen (1934) observed 40 or more that regularly visited Lake Calumet in late August and left (consistently) about 5 p.m., flying southwestward, presumably to a roost. The nature of the roost was unknown.

The peak in fall numbers of great blue herons appears to come between 1 August and 20 September in southern Illinois, and 16 August–20 September in central and northern Illinois (Fig. 3). The fall numbers are too large to represent only Illinois production. The ratio of spring to fall counts of great blues was 1:3.05 for the entire state (1967–1970), 1:3.8 for southern Illinois (1967, 1970), and 1:4.7 for central Illinois (1969), but only 1:1.3 for northern Illinois (1968). Whether the low ratio for the north represents regional or annual variation is unknown. The best possible age ratio deducible from our data on productivity (Table 3) would be 1 adult:1.25 juveniles (based on 2.5 young per nest). Excluding (yearling?) non-breeders, this ratio falls far short of the 1:3 fall ratio observed for the state, and much of the fall count may represent immigration from more southern breeding populations.

### Winter Records

Most great blue herons have left Illinois by the end of October (Fig. 3). Birds present in November and December may be late stragglers attracted to open water and good fishing areas, but the sources of these birds and their seasonal status are unknown. The Christmas counts show that at least a few great blues are present even in northern Illinois in most years (Fig. 7 and 8). They are much more frequent in southern Illinois. There is a highly significant correlation ( $r = 0.596$ ,  $P = 0.001$ ) between the frequency of occurrence of great blues on the Christmas counts and the average December temperature in northern, central, and southern Illinois. The frequency in-



# Great Blue Heron



## WINTER RECORDS

- = 1950-
- ▲ = 1900-1949
- = Before 1900

Fig. 7.—Distribution of winter (15 December–1 February) records of the great blue heron in Illinois. Heavy horizontal lines separate the three regions referred to in the text.

creases at temperatures above about  $-1^{\circ}\text{C}$ . There is no significant correlation between the occurrence of great blues and temperatures in November or January. Of the three regions, only southern Illinois has long-term average temperatures above  $-1^{\circ}\text{C}$  in both December (about  $2^{\circ}\text{C}$ ) and January (about  $1^{\circ}\text{C}$ ), and great blues may be expected there throughout the winter but only in small numbers. As open waters in northern and central Illinois freeze up, the number of herons probably declines, but population measurements have not been made beyond the Christmas count period (about 2 January). Michael Morrison noted that great blues did not remain even in southern Illinois during the severe winter of 1976–1977.

Nothing is recorded on the winter ecology of the species.

## Food

Most of the data on food of great blue herons in Illinois represents regurgitated food of nestlings (Table 4). Whether adults eat approximately the same things is unknown. Even the data for nestlings may be biased if the young tend to cast up certain foods more than others. The samples we gathered at 12 colonies around the state (see introduction) indicate that two species—gizzard shad and carp—comprise over half the food of young great blues. Four groups of fishes—shad, carp, buffalos, and sunfishes—make up about 80 percent of the food. One or more of these food species have also been reported by Muselman (1933, 1934–1935), Angus (1937), Harlan (1943), Hodges (1950), and Lopinot (1950). In addition to the prey species listed in Table 4, “catfish,” “mud-eel” (*Siren*), “frogs,” and “snake” have been reported as food of great blues in Illinois. The only data on the food of an adult great blue is that recorded by Lopinot (1950), who found a 7-inch white crappie in the stomach of one specimen. All species listed in Table 4 have generally high populations in Illinois.

Besides the need for data on the seasonal and geographic variation in the food of adults (especially), there is need for studies on feeding rates and feeding areas of great blues and other herons in Illinois. Lopinot (1950) observed that the size of food items increased as the young grew. We have measured carp as long as 30 cm from nests with very large young (see also Hodges 1950).

Food for the colony may be taken nearby. We have observed great blues from the Lusk Creek colony foraging in Lusk Creek, but have also seen them

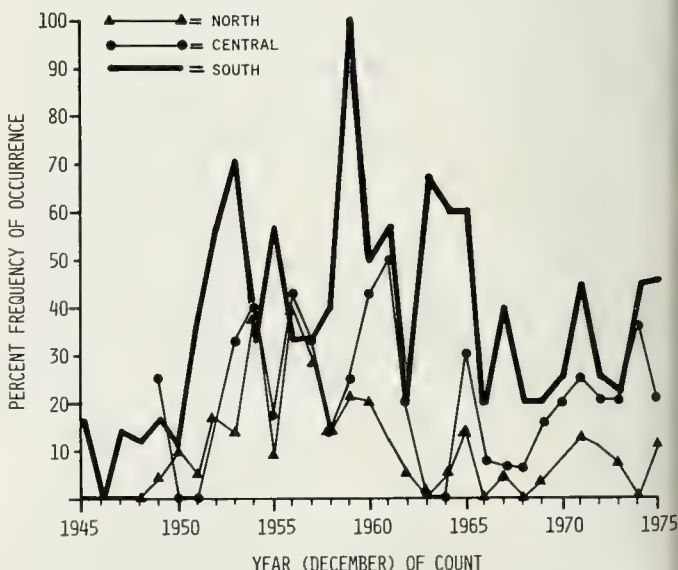


Fig. 8.—Frequency of occurrence of great blue herons on Christmas counts in the three regions of Illinois.

TABLE 4.—Food collected from nestling great blue herons at Illinois heron colonies, 23 June–1 August 1973–1977.

Food Item	Number of Specimens				Total Specimens	Percent of Total	Estimated Weight of Food (Grams)	Percent of Weight
	Illinois River	Upper <sup>a</sup> Mississippi River	Lower <sup>b</sup> Mississippi River	Ohio River Drainage				
Crayfish ( <i>Orconectes virilis</i> )	0	1	1	0	2	0.4	?	?
Longnose gar ( <i>Lepisosteus osseus</i> )	0	0	1	0	1	0.2	30	0.2
Shortnose gar ( <i>L. platostomus</i> )	0	0	3	0	3	0.5	120	0.9
Gar ( <i>Lepisosteus</i> species?)	0	0	3	2	5	0.9	200	1.5
Bowfin ( <i>Amia calva</i> )	0	0	4	3	7	1.3	105	0.8
Gizzard shad ( <i>Dorosoma cepedianum</i> )	19	35	63	94	211	38.6	4,220	31.0
Grass pickerel ( <i>Esox americanus</i> )	0	0	0	2	2	0.4	30	0.2
Stoneroller ( <i>Camptostoma anomalum</i> )	0	1	0	0	1	0.2	3	+ <sup>c</sup>
Goldfish ( <i>Carassius auratus</i> )	0	2	0	0	2	0.4	8	0.1
Carp ( <i>Cyprinus carpio</i> )	6	13	58	8	85	15.6	3,400	25.0
Golden shiner ( <i>Notemigonus crysoleucas</i> )	0	0	0	11	11	2.0	22	0.2
Emerald shiner ( <i>Notropis atherinoides</i> )	0	6	0	0	6	1.1	12	0.1
Red shiner ( <i>N. lutrensis</i> )	0	2	0	0	2	0.4	2	+
Minnow (mainly <i>Notropis</i> species?)	0	6	0	0	6	1.1	12	0.1
Quillback ( <i>Carpodacus cyprinus</i> )	0	3	0	0	3	0.5	285	2.1
White sucker ( <i>Catostomus commersoni</i> )	0	5	0	0	5	0.9	375	2.8
Creek chubsucker ( <i>Erimyzon oblongus</i> )	0	0	0	6	6	1.1	420	3.1
Smallmouth buffalo ( <i>Ictiobus bubalus</i> )	0	1	1	2	4	0.7	100	0.7
Bigmouth buffalo ( <i>I. cyprinellus</i> )	0	21	23	34	78	14.3	936	6.9
Buffalo ( <i>Ictiobus</i> species?)	0	22	0	0	22	4.1	264	1.9
Northern redbreast ( <i>Moxostoma macrolepidotum</i> )	0	2	0	0	2	0.4	70	0.5
Flier ( <i>Centrarchus macropterus</i> )	0	0	0	2	2	0.4	16	0.1
Warmouth ( <i>Lepomis gulosus</i> )	0	0	0	2	2	0.4	70	0.5
Green sunfish ( <i>L. cyanellus</i> )	0	0	4	7	11	2.0	220	1.6
Pumpkinseed ( <i>L. gibbosus</i> )	0	0	0	1	1	0.2	90	0.7
Bluegill ( <i>L. macrochirus</i> )	0	36	5	5	46	8.4	1,380	10.1
Sunfish (species?)	0	0	0	3	3	0.5	24	0.2
Largemouth bass ( <i>Micropterus salmoides</i> )	0	1	2	1	4	0.7	160	1.1
Black crappie ( <i>Pomoxis nigromaculatus</i> )	0	2	0	1	3	0.5	150	1.1
Freshwater drum ( <i>Aplodinotus grunniens</i> )	0	6	2	2	10	1.8	900	6.6
<b>Total</b>	<b>25</b>	<b>165</b>	<b>170</b>	<b>186</b>	<b>546</b>	<b>100.0</b>	<b>13,624</b>	<b>100.1</b>

<sup>a</sup> Mercer County and north.<sup>b</sup> Pike County and south, including the Kaskaskia drainage.<sup>c</sup> Less than 0.1 percent.

flying to the vicinity of the Ohio River about 10 km from the colony.

### Longevity and Mortality

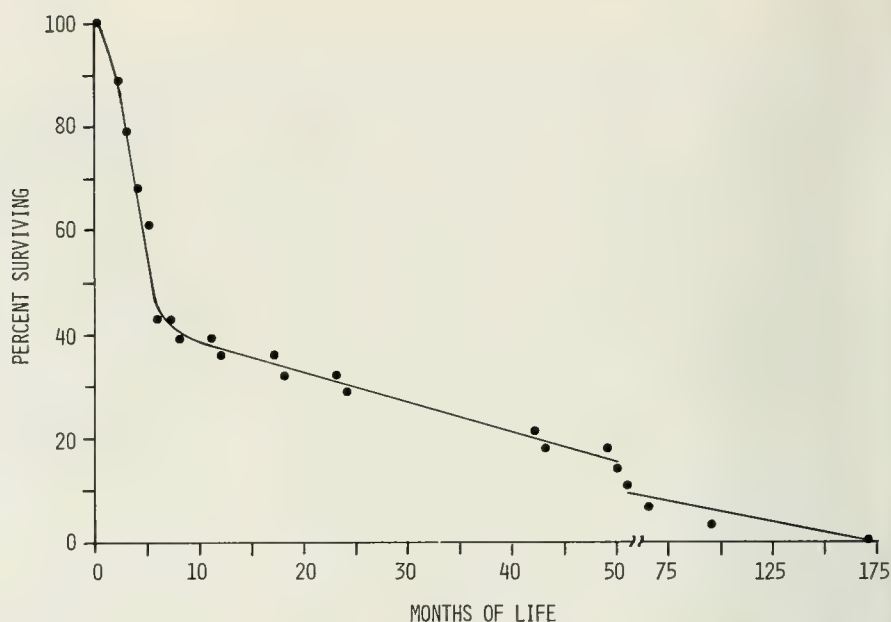
Between 1933 and 1949 Bartel (1976) banded 445 nestling great blue herons at the Depue colony. The 28 birds recovered from his exemplary study had an average age of about 2 years at death (four specimens captured alive were included as representing mortality). Survival was very poor in the first 6 months, with about 60 percent of the young population being lost (64 percent in the first year, Fig. 9). This mortality rate is a measure of the cost of inexperience, including a lack of wariness toward humans. Shooting was the only cause of death given, and a high loss in October and November is also indicative of hunter-vandals as the cause of mortality. After the less wary birds were killed in the first 6 months, mortality dropped to an average 24 percent per year.

One bird survived 14 years, 3 months. The mortality figures are similar to those given by Owen (1959–1960) based on a much larger number of recoveries for all of Canada and the United States between 1916 and 1945. His figures were 71 percent loss in the first year and an average annual rate of 29 percent after the first year. In his larger sample, one bird survived 21 years.

There are no comparable data on mortality for more recent years to determine whether the survival rate is changing. Bartel's record represents a period when great blues were apparently thriving (see under populations), but in recent years the population has been declining about 12–18 percent per year. At the survival rate calculated by Owen (1959–1960), productivity of great blues (assuming first reproduction at about 2 years of age) would have to be 2.8 young per nest to sustain the population. The best productivity we observed was 2.5 young per nest, a number that



Fig. 9.—Survival of great blue herons banded as nestlings in northern Illinois. Some points represent more than one bird.



implies a loss (at the mortality rate cited) of about 3 percent per year; but our figures do not take into account broods or nests that were lost entirely.

The banding recoveries are instructive in showing why great blues seek isolation from humans. It is an isolation increasingly difficult to find, and the human pressure may already exceed what some of the Illinois populations can stand.

### Specimen Data

Ridgway's (1881 and 1895) references to the occurrence of *Ardea occidentalis*, or *A. "wuerdemannii"* in Illinois probably relate to the same observation of a single bird on the Wabash River near Mt. Carmel, 11–22 September 1876. The bird, a large, white-headed great blue heron, fits the description of so-called Wuerdmann's heron, which Ridgway (1895) suggested was a hybrid between *A. occidentalis* and *A. herodias*, now considered to be conspecific (Eisenmann 1973).

Oberholser (1913) discussed specimens of *A. herodias* from southeastern Illinois and adjacent Indiana, pointing out that in their pale coloration they resembled *A. h. wardi* of the southeastern U.S., but are smaller in size.

We have weight data on only two (April) specimens—a subadult male from Fulton County (2,268 g), and an adult female from Iroquois County (1,673 g). Both specimens were lean.

## NORTHERN GREEN HERON (*Butorides striatus virescens*)

(Fig. 10 and 11)

Among the recent recommendations of nomenclatural changes suggested by the American Orni-

thologists' Union's Committee on Classification and Nomenclature (Eisenmann 1973 and 1976) is the combining of *Butorides virescens* and *striatus* under the latter name.

### Spring Migration

Green herons are generally rather late migrants, not being seen in Illinois before mid-April, with the bulk of the birds not arriving before late April and May (Fig. 12). There are at least two March records, one for southern Illinois (George 1968) and one for Cook County in 1949 (Dring unpublished), but these are very exceptional. Even early April records are unusual (Kleen 1974e, 1975c, 1976b). There appears to be little difference in arrival dates between the different regions of the state, possibly reflecting long-distance night migrations by the species.

In central Illinois we have heard green herons calling at night, presumably as they migrated, from 22 April to 20 May between the hours of 9:00 p.m. and 4:00 a.m. CST.

### Distribution

The northern green heron (*virescens*) has a broad range in the United States and Central America (Fig. 11). In Illinois it may nest in every county, though definite records are lacking for many, possibly reflecting the paucity of observers (Fig. 13).

### Nesting Habitats and Populations

Gates' (1911) designation of the green heron's primary habitat as sand or mud strand and secondarily as prairie marsh and bottomland woods is a very apt description. He implies edge habitats, especially in low-lying areas. On the cross-country censuses (Graber & Graber 1963) the two habitats in which green herons most often occurred were marsh



Fig. 10.—Adult green heron near its nest. The green is a relatively small heron (about 30 cm tall) with glossy, metallic green wings, and the sides of the neck rich chestnut.



# Green Heron

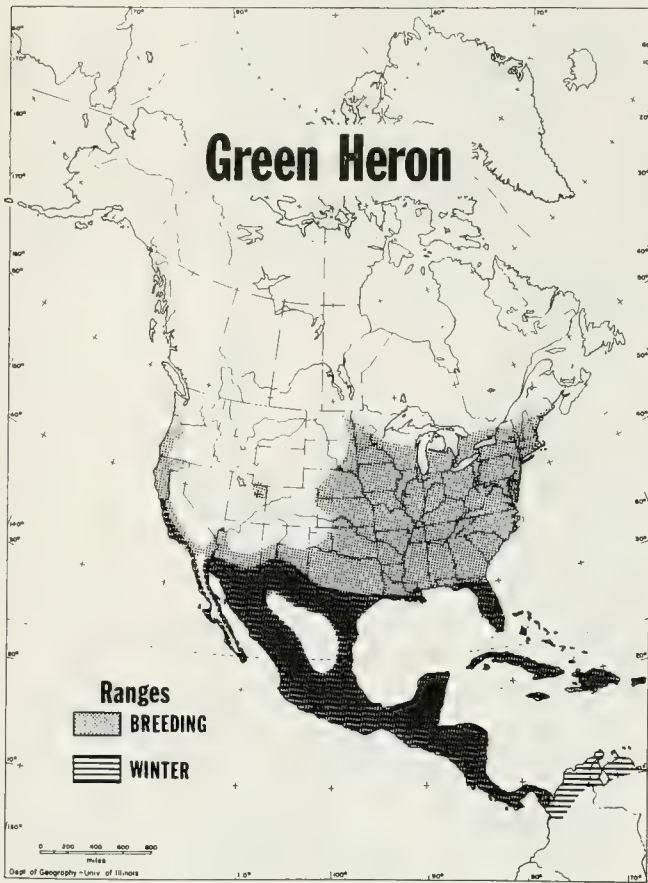


Fig. 11.—General distribution of the green heron.

and pasture, the latter especially in the early (1907–1909) censuses, when pastures often included some shrub areas and marshy spots. The population figures for forest habitat (Table 5) probably represent mainly forest edge, forest openings, or small stands. In our extensive censuses of mature forests in southern Illinois (Table 5) we have never encountered green herons in upland forest or in the interior, even of bottomland woods. Younger, less extensive, stands may have higher populations, as they seem to have in central and northern Illinois. It should be remembered that density data on small tracts of habitat are misleading and may be especially so for the green heron as an indication of the general population. The data do not account for the numerous small tracts with *no* herons, as herons have a very spotty distribution. Brewer (1958*b*) found the green heron in the 6-to-9-year-old vegetation of strip-mined land, and nests are most often reported as being in young trees.

Green herons have shown some tolerance of the human population, and Ridgway (1887 and 1925) found the species nesting in Mt. Carmel and Olney. There are, however, probably few modern urban areas with nesting green herons, and there seems little

likelihood of sustaining a population in the urban habitat. In times past, at least, green herons sometimes nested in orchards (Silloway 1906, Olmstead 1906, Hess 1910, Bennett 1953), but there are no recent data on the use of this habitat.

Nesting green herons are often associated with willows (Coursen 1947), species of which are the most commonly reported nest trees. Nests have also been observed in apple, crab apple, hawthorn, buttonbush, cottonwood, balsam poplar, plum, bald cypress, and “maple” trees (Chase 1899, Hankinson 1914, Sanborn & Goelitz 1915, Jones 1936*c* and 1937*a*, Beecher 1942, Freeman 1951, Haertel 1963). Nest heights have been reported to vary from 1 to 14 m in Illinois, but are most often 2–6 m. As with herons generally, the foraging habitat of the green heron has never been defined either qualitatively or quantitatively.

Green herons nest both as isolated pairs and in colonies. Sometimes they nest with other species of herons. The colonies are usually small—fewer than 20 pairs. Yeager (1949) found four colonies in the Pere Marquette State Park area that averaged 20 nests each. Assemblages of 100 or more nests have been reported (Jones 1936*c*). Musselman (unpublished notes 1922) estimated there were as many as 500 nests in one area on Lima Lake, but no large colonies have been reported in recent years. As early as 1890 Barnes (1890*b*) believed the green heron population was declining. In 1907–1909 Gross and Ray encountered 12 green herons within the 714 km of transects through all types of summer habitats in the state. In a nearly equal length of transects (708 km) in 1957–1958, we encountered only two, indicating more than an 80-percent loss. The counts of spring migrants in central Illinois also indicate a decline. Counts of green herons made in east-central Illinois by Frank Smith and his students between 1903 and 1922 were almost invariably higher (by a factor of 2–3 times) than our counts in the same area between 1957 and 1969 (Fig. 12). All the available data indicate a serious decline in the green heron population in this century. Specific causes cannot be assigned without more detailed information on the ecology of the species. Causes almost certainly include the burgeoning human population that is: (1) destroying and polluting many habitats, including wetlands, and (2) increasing disturbance in all habitats.

## Nesting Cycle

The impressive displays that accompany the courtship and mating of green herons (Palmer 1962) have not been described in the Illinois literature. The only calls we have heard from the species are the loud, sharp, single-noted “keeow” call uttered, sometimes repeatedly, at almost any time the bird flies, including night, and a kind of scolding call uttered when

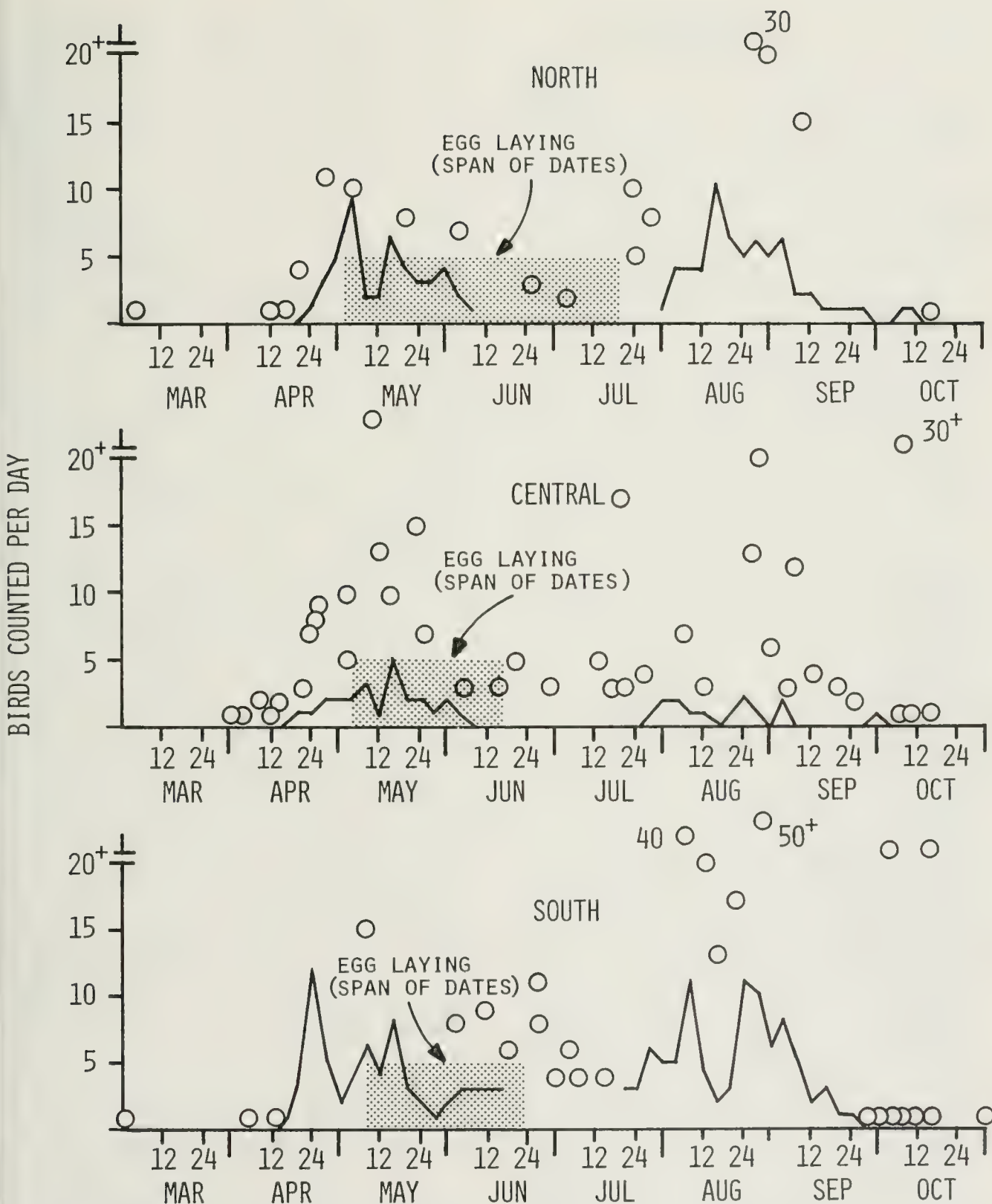


Fig. 12.—Egg-laying and migration seasons of the green heron in different regions of Illinois. Spring and fall graph lines show the highest daily count of each 4 days (1967–1970). Hollow circles represent counts made in other years or by other observers. Shaded areas show the span of dates during which egg laying has been recorded.



# Green Heron

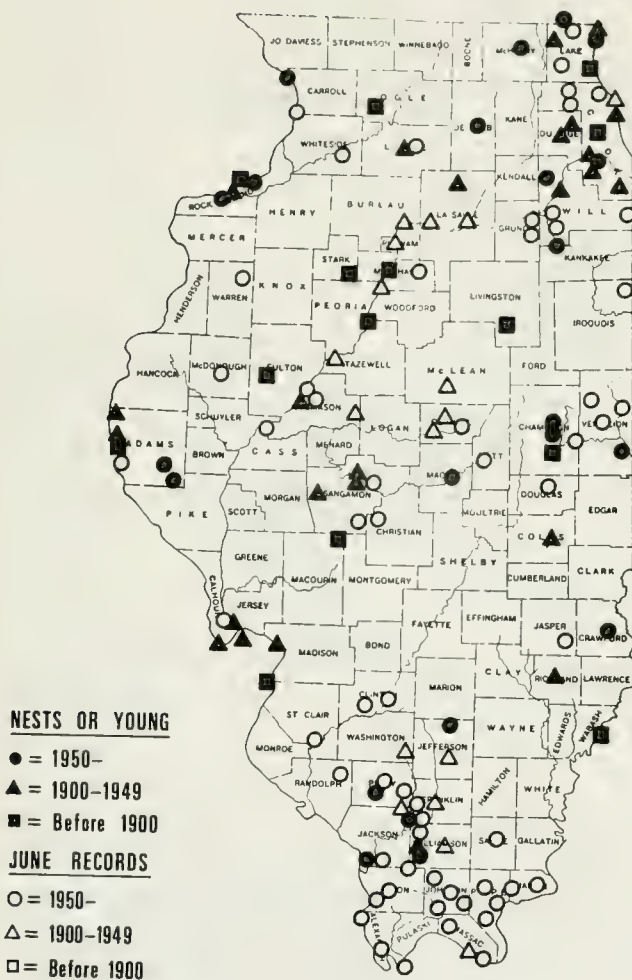


Fig. 13.—Distribution of breeding records of the green heron in Illinois.

a bird is disturbed—a series of flat “kuk-kuk-kuk” notes (Chase 1899).

Nest building has not been described, but Chase (1899) provided a uniquely detailed description of the structure of two nests in Stark County. The nests—one in a plum tree, the other in a crab apple—were made entirely of sticks of willow, plum, box elder, cherry, crab apple, and hawthorn. The number of twigs in each nest—267 in one, 265 in the other—gives some measure of the amount of work involved. The longest piece was 76 cm. Largest outside dimensions were: 33 × 43 cm (diameter), and 13 cm deep. The nest bowl was 13 × 20 cm and 5–8 cm deep.

The eggs are pale blue (Silloway 1906) or greenish blue. White (1890) stated, and gave measurements to show, that eggs of Illinois birds (location?) were larger than egg specimens from Rhode Island and Texas. There are no additional observations or

explanations of these size differences. The number of eggs in each of 42 green heron clutches were: 6 eggs—three (7 percent), 5 eggs—eleven (24 percent), 4 eggs—twenty-five (56 percent), 3 eggs—four (9 percent), 2 eggs—two (4 percent). The data represent scattered, often casual, observations, made mainly in northern and central Illinois before 1920. At a colony near Vincennes, Ridgway (1882) observed that five nests out of seven had 5-egg clutches. From fresh-egg dates and hatching and fledging dates, we estimated the laying season of the green heron to extend from 2 May to 19 July in northern Illinois. The season is probably about the same for the other regions, as there appears to be little difference in the green heron's time of arrival in different regions of the state. Most of the laying dates fall between 8 May and 12 June.

Though observations are lacking for Illinois, in New York, Meyerriecks (1960) found that both sexes incubate, the incubation period being about 20 days, and that young birds make their first flights at 21–23 days of age. At least some yearling birds breed. There are no Illinois data on nesting success or productivity.

## Fall Migration

If green herons move northward after the nesting season in the fashion of other herons, there are no published banding records to show it. Nelson (1877) noted that the species became very abundant in the Mt. Carmel area after 1 August, and most of the fall migration occurs in August. The fall counts of green herons do not show massive influxes of birds in late summer like those, for example, of the great egret (Fig. 12 and 29). The peak counts of green herons have come in late August, or early September, but the numbers have fallen off rather sharply about 8–12 September in all regions (Fig. 12). Relatively few birds linger into October, rarely as late as the 16th.

We have heard green herons flying at night, presumably in migration, from 2 September to 15 October between 8:00 p.m. and 4:00 a.m. CST, but strangely, never in August. We have heard very few, and the seasonal lateness of the records may merely reflect an accident of the sampling. Also indicative of low flight densities is the fact that we have never retrieved a green heron from any of the television tower kills of migrants.

The ratio of our spring (April–May) to fall (August–October) counts were similar in northern (1.0 bird seen in spring to 2.2 in fall) and southern Illinois (1.0:2.0); the ratio in central Illinois was inexplicably and strongly reversed (5.4 in spring to 1.0 in fall). It should be remembered that the entire central Illinois count was very low in 1969, when these data were gathered.

Green herons are seen very rarely in late fall and even in winter. There are at least two November

TABLE 5.—Breeding populations of green herons in various Illinois habitats. The figures may represent birds that are only foraging (not nesting) in the habitat.

Habitat	Hectares	Birds per 40.5 ha	Years	Type of Census	Region or County	Reference
Urban residential	40	0	1958	Strip	South	Graber & Graber 1963
Urban residential	143	0.3	1976–1977	Strip	South	This paper
Swampy prairie	27	0–12 (Avg 5.1)	1941–1944	Map	Sangamon (C) <sup>a</sup>	Robertson 1941a, 1942a, 1944a
Marsh	35	2–3 (Avg 2.3)	1957–1958	Strip	North	Graber & Graber 1963
Oak-hickory woods	11	7	1936	Nest	Lake (N)	Beecher 1942
Upland second-growth oak-hickory	23	0–4 (Avg 3.6)	1941–1944	Map	Sangamon (C)	Robertson 1941b, 1942b, 1944b
Second-growth hardwoods	6	0–13 (Avg 6.7)	1937–1938	Map	Rock Island (N)	Fawks 1937, 1938
Grazed bottomland woods	21	2	1955	Map	Macon (C)	Chaniot & Kirby 1955
Virgin floodplain forest	31	3	1948	Map	Sangamon (C)	Snyder et al. 1948
Mature bottomland forest	830	0–12 (Avg 0.8)	1973–1977	Strip	South	This paper
Mature upland oak-hickory	403	0	1974–1977	Strip	South	This paper
Pasture	179	1	1907, 1909	Strip	Central	Graber & Graber 1963
Pasture	70	0	1957, 1958	Strip	Central	Graber & Graber 1963
Pasture	357	0.2	1907, 1909	Strip	South	Graber & Graber 1963

<sup>a</sup> C refers to the central region of Illinois, and N to the northern, as shown on winter distribution maps, e.g., Fig. 7.

records for southern and central Illinois (George 1968, Bohlen unpublished notes). In addition to an early December record for East St. Louis (Comfort 1955a), green herons have been seen on Christmas counts at Decatur (Chaniot 1959), Forest Glen (Campbell 1972), and Wilmington (Bartel 1972). Bohlen (unpublished) noted that a green heron present 10 November in Sangamon County was at a warmwater litch.

## Food

N. D. Moore's description of the fishing style of the green heron was so apt that Ridgway (1895) quoted it, and it bears paraphrasing here. This heron fishes from the shore or a log or rock, preferring not to stand in the water, as the larger herons do, but if it sees some tempting morsel it will wade toward it. It steals upon its prey slyly, catlike, crouching and remaining motionless for a long time, sometimes advancing so slowly that its motion is barely perceptible. It jealously guards its feeding grounds. Haertel (1963) noted that green herons frequented the same areas as grackles.

Small samples of regurgitated food specimens from young green herons in northern Illinois consisted of small (2–10 cm) sunfish and minnows, with rayfish making up a large part of the food (Chase 1899, Olmstead 1906). The only observation on the food of an adult was very different. The stomach of a male collected by Gault (unpublished notes 1912) in August was filled with grasshoppers.

## Specimen Data

Oberholser (1912) found the green herons of the northeastern United States, including Illinois, to

be very homogenous, representing the subspecies *virescens*.

## LITTLE BLUE HERON (*Florida caerulea*)

(Fig. 14 and 15)

### Spring Migration

Little blue herons apparently migrate northward beyond their breeding areas in spring and are not infrequently seen in central and northern Illinois at that time. The earliest sighting of the little blue for northern Illinois is 31 March (Brownell 1916). In central Illinois none have been reported before 3 April (1977) (R. J. Schifo unpublished). They arrive in southern Illinois in late March, the earliest recorded arrival for that area being 27 March (Kleen 1976b). Peak numbers occur in the south in late April and in the central part of Illinois in mid-May (Fig. 16). The distribution of spring records is shown in Fig. 17. In addition to those indicated, spring records exist for Ogle County, Morgan County, and southwest Pike County (no specific localities given).

### Distribution

The little blue heron is a species of the southeastern U.S.A. and Central and South America (Fig. 15). In Illinois little blues have nested at least as far north as Pike County on the Missouri side of the Mississippi River (William H. Elder unpublished). The known breeding colonies have been mainly on the west side of the state along, or not far from, the Mississippi River (Fig. 17) though Butler (1897) indicated that they bred near the Illinois boundary in



the lower Wabash valley of Knox and Gibson counties, Indiana. There are few recent observations of

the species on the eastern side of the state even in the south. The only extant colony presently known



Fig. 14.—(Top) Adult little blue heron foraging at Union County Refuge, 13 June 1965. Larger (about 50 cm tall) than the green heron, the little blue has a dark bluish body, with purplish neck. (Bottom) Adult little blue heron in worn plumage, attending its nestlings at the Comment Sanctuary near East St. Louis. Photograph by Robert Starr.



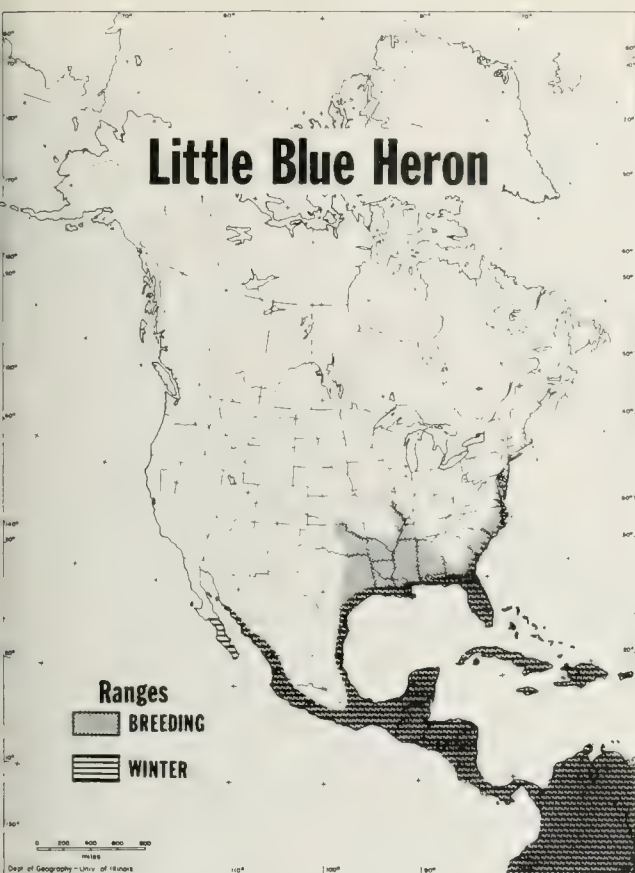


Fig. 15.—General distribution of the little blue heron.

in Illinois is the Comment Sanctuary, East St. Louis, but June records on the Mississippi as far north as Calhoun County (Anderson 1963b) and for Mason County on the Illinois River (Kleen 1974–1975) suggest the possibility of nesting in these areas. There are also June records of little blues (age unspecified) for northeastern Illinois (Ford 1956, Fawks 1970b, Dillon 1971). There are reports of little blues having nested in or near Illinois in the following areas: Dardenne Lakes near Peruque, Missouri (Jones 1936a, 1937a, and 1939b); Marais Temps Clair marsh, St. Charles County, Missouri (Jones 1937a); “Fults Island” (Fleig 1971); and Clear Creek near Gale, Illinois (Schwegman unpublished 1968, George 1968). There is reference to the nesting of little blues at Kidd Lake (Prairie du Rocher area) and near Chester (Kaskaskia Island?) though it is not clear whether nests were actually found (Fawks & Lobik 1975). A large colony that we found in 1975 on Billings Island on the Missouri side of the Mississippi was abandoned in 1976.

### Nesting Habitats and Populations

The little blue heron has most often been found nesting in colonies with black-crowned night herons, but it also nests with great egrets, cattle egrets, snowy egrets, green herons, and great blue herons. The nesting colonies of little blues have generally been in

thick stands of relatively young trees. At Billings Island the nests were in young black willows (about 13–15 cm DBH); the colony at Dardenne Lake was also in willows, but the Gale colony was in small cottonwoods. At Comment Sanctuary the nests were situated in a variety of deciduous trees (see under cattle egret). A very large colony near Bertrand, Missouri, was in shortleaf pine plantations on the floodplain of the Mississippi River (Greenberg & Heye 1971). The only obvious quality that these nesting sites have in common is their dense, thickety growth form, and we suspect that the foraging habitat may be more important to the colony than the woody vegetation available as nesting substrate. At Billings Island little blue heron nests were placed relatively low—2–5 m from the ground—in the crotches of black willows (Fig. 18). The nests would seem to be very vulnerable to raccoons and other predators, which may have a bearing on the island setting of several of the colonies, the Bertrand colony being a very important exception.

There are no population measurements for the little blue heron in Illinois. No little blues came within the transects of the cross-country censuses either in 1907–1909 or 1957–1958, indicating that the population was not large in either period. Individual colonies in the region have ranged in size from 25 or fewer birds at East St. Louis (Anderson 1964a) to an estimated 600 nests on Billings Island. The Billings colony is believed to have lasted only 3 years, changing from a few nests in 1973 to 600 in 1975 to none in 1976, the changes possibly related to population shifts in the large Bertrand colony (Paul Heye personal communication). The East St. Louis population was first reported nesting in 1962 at Grand Marais (Frank Holten) State Park (Anderson 1962b, Galbreath 1962). It returned there in 1963 and 1964 (Anderson 1964a), when the trees in the colony site were cut down and the birds moved to the nearby Comment Sanctuary. At the Comment Sanctuary the Southwestern Chapter of the Illinois Audubon Society has made counts of all herons in July every year, beginning in 1968. The number of little blues has varied from 10 adults and no young (1968) to 150 adults and 300 young in 1970 (Wrischnik 1973 and 1975–1976, Kleen 1974–1975 and 1976–1977), but these figures may include transient birds that do not nest locally.

### Nesting Cycle

No studies have been made of the nesting cycle of the little blue heron in Illinois. Studies made in Arkansas and Florida (Palmer 1962) indicate the total time required to rear four young from the start of nest building to the independence of the young to be around 80 days. Nest building required 5–7 days. The laying of a clutch (usually 3–6 eggs) may take 6–12 days, as the eggs are laid about every other day. The incubation period is 23 days. The



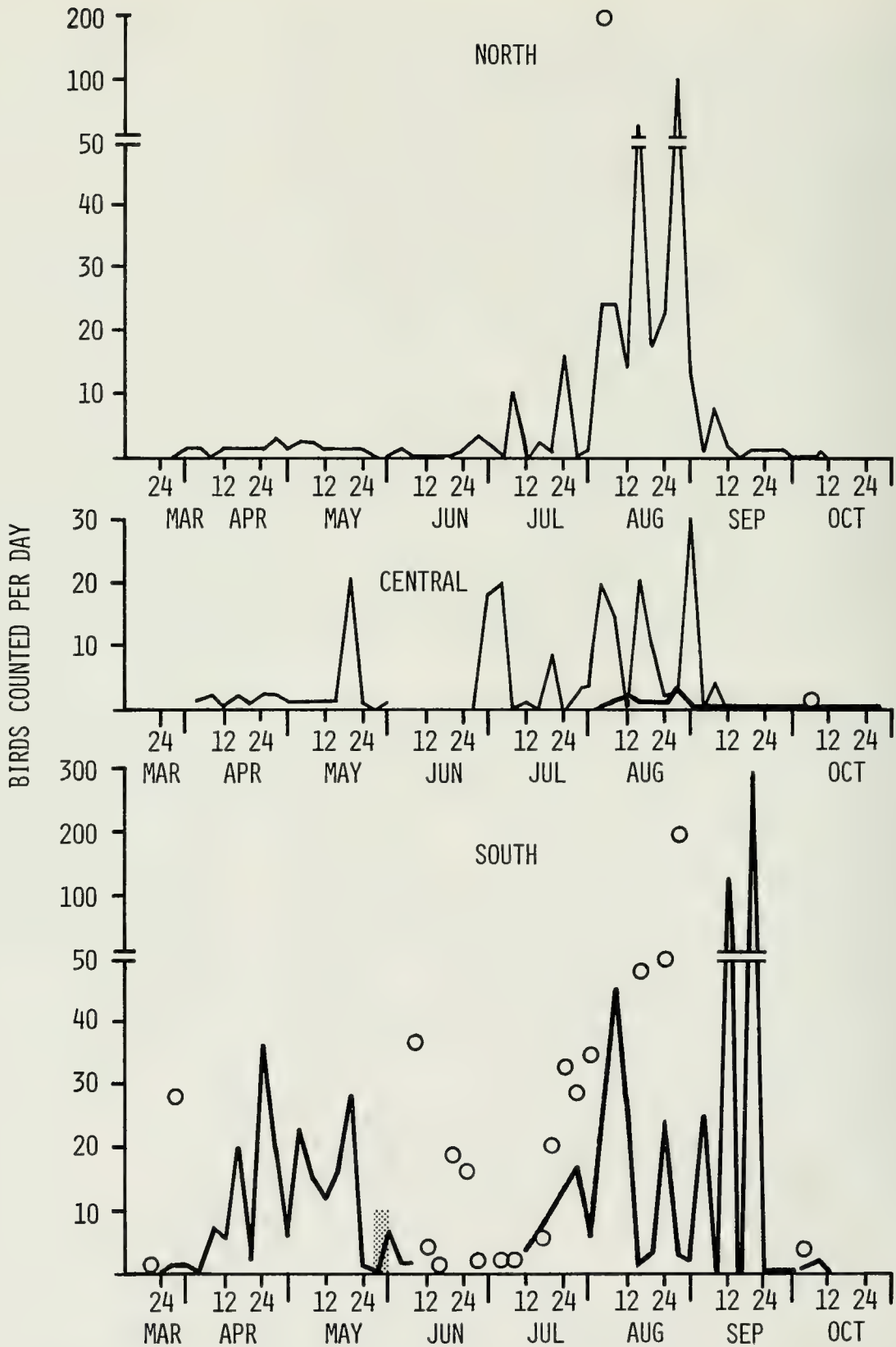


Fig. 16.—Migration seasons of the little blue heron in different regions of Illinois, as indicated by the highest counts of all observers (thin line) in north and central Illinois and our counts (heavy line) in central Illinois (1969) and southern Illinois (1967 and 1970). Circles represent counts made in other years or by other observers. The shaded area in the south represents the only recorded egg dates.

# Little Blue Heron

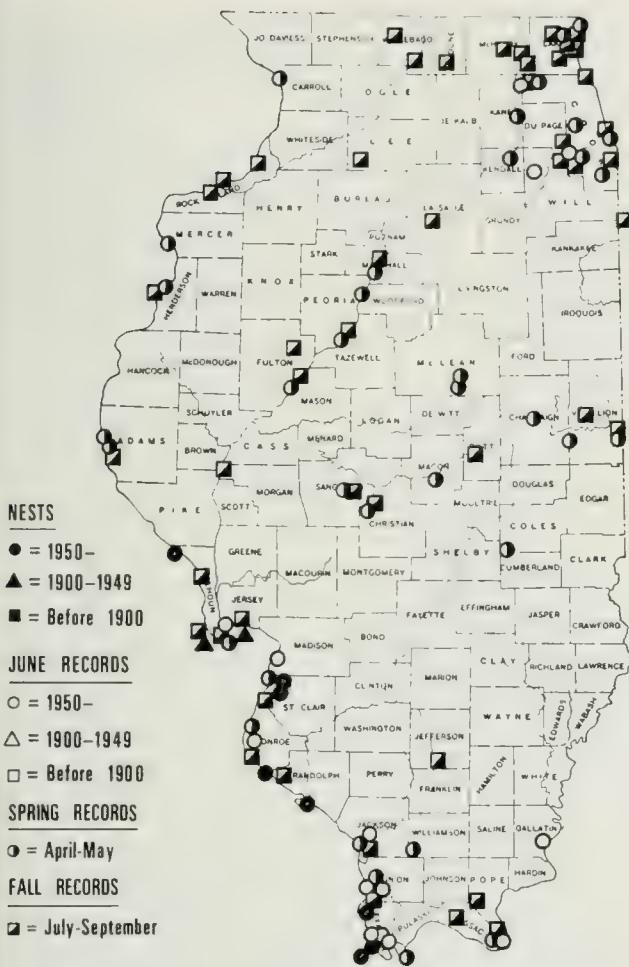


Fig. 17.—Distribution records of little blue herons in Illinois.

eggs hatch over a period of 3–5 days, since incubation starts with the laying of the second egg. At 30 days the young can fly a little but are still pursuing the adults for food. Some yearling birds nest, but what part of the population they constitute is unknown (Palmer 1962).

The little blues that we observed on Billings Island on 7 July 1975 had young around 17–20 days of age (Fig. 18), indicating that the eggs had hatched around 17–19 June from eggs laid 25–27 May. Peterson (1965) said that hatching at the Bertrand heronry, where 80 percent of the birds are little blues, occurred about the third week of May and that activity at the heronry subsided by the end of July.

There are no data on nest success or productivity of little blue herons in Illinois. The July censuses of the Comment heronry indicate an overall ratio of 1 adult to 1.8 young (Table 6), but it is not certain that these counts refer only to local birds. Counts are needed from the beginning of the nesting season to

determine the actual number of pairs nesting, the number of eggs laid, and finally the number of young produced in each nest, or at least in a sample of nests.

There are no data on longevity, mortality, or productivity for the little blue heron. Greenberg & Heye (1971) found low levels of chlorinated hydrocarbons in eggs and tissues of young and adult little blues from the Bertrand colony. Colony sites of little blues have been lost from flooding at Clarksville (William Elder personal communication) and the cutting of trees at Gale (Schwegman unpublished) and Grand Marais (Wrischnik 1973).

## Fall Migration

By the end of July or earlier young little blue herons are appearing north of the breeding colonies in Illinois (Smith 1941, Petersen & Ward 1966, Kleen 1974d). The peak of the northward movement appears to be in late August (Fig. 16.) Banding records suggest that some of the birds in southern Illinois in late summer have come from heronries in northern Mississippi (Dusi 1967). By the third week in September peak numbers occur in southern Illinois as these herons retreat from the north, and by late September most are gone from Illinois (Fig. 16). Very few linger into October. There is one record for northern Illinois on 9 October 1938 (Boulton & Pitelka 1938). In central Illinois little blues have been reported as late as 6 October 1975 (Kleen unpublished). The latest records for southern Illinois are 11 October (George 1968) and 10 October 1970 at Ware (Paul Heye unpublished) and two immatures seen on 10 October 1970 between the Union County Refuge and Grand Tower by R. R. Graber.

There appears to be a periodicity in the numbers of little blue herons seen in late summer in Illinois with peaks occurring about every 20 years (Fig 19). Table 6 shows that far greater numbers of immature birds (in white plumage) than adult birds (blue plumage) are seen in the fall, especially in the north and central parts of Illinois. Even in the south the ratio of one adult to five immature little blue herons is greater than would be accounted for by breeding production and probably indicates an influx of young birds from colonies outside of Illinois. It may also indicate a greater inclination on the part of young birds to wander northward and to linger in northern localities than is the case with adults. The distribution of fall records in Illinois is shown in Fig. 17.

## Roosting

There are two accounts in the literature of roosts of the little blue heron in or near Illinois. Nelson (1877) said that toward evening little blue herons, along with other herons, moved to a common roosting place in a large opening in the Mississippi bottoms (locally called the "deadening") about 6 miles from Cairo. A few straggled in about an hour before sun-



set, the numbers reaching a peak just before sunset. At the Dardenne marsh (St. Charles County, Mis-

souri) Short (1938) wrote that on 26 August of that year 200 little blues were flying in small bands of



Fig. 18.—Young little blue herons near their nest on Billings Island, 7 July 1975. Note black tips of the primaries, a character lacking in the similar-appearing cattle egret young (Fig. 25). Little blues are white for more than a year before attaining the all-blue adult plumage.

TABLE 6.—Age ratios of little blue herons in Illinois.

Region of State	Time of Year	Number of Birds in Sample	Percent in Plumage Color			Ratio of Blue:White
			Blue	Calico	White	
North & Central	April to June	48	50	37.5	12.5	4:1
South	April to June	182	73	0	27	2.7:1
South	June	43	70	11	29	2.7:1
South <sup>a</sup>	July	1,526	36	0	64	1:1.8
North & Central	July to Oct.	283	3	0	97	1:30
South	July to Oct.	671	16	4	80	1:5

<sup>a</sup> Annual census made in July (1968–1976) at Comment heronry. Other data in the table are counts made of foraging birds. Counts for the southern region were made by us; those for the north & central regions come from the literature from 1926 to 1976.

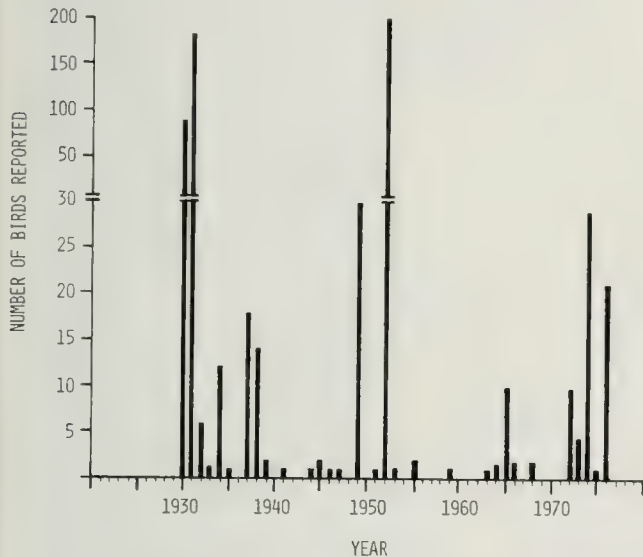


Fig. 19.—Numbers of little blue herons reported in Illinois in late summer in different years.

15–50 with great egrets to roost in a buttonbush marsh.

## Food

Food items in regurgitated boluses picked up at the colony on Billings Island in 1975 are listed in Table 7. It is readily apparent that the bulk of the food in this sample is rather small fishes. Most of the fishes were about 5 cm in length, the largest 9.5 cm and

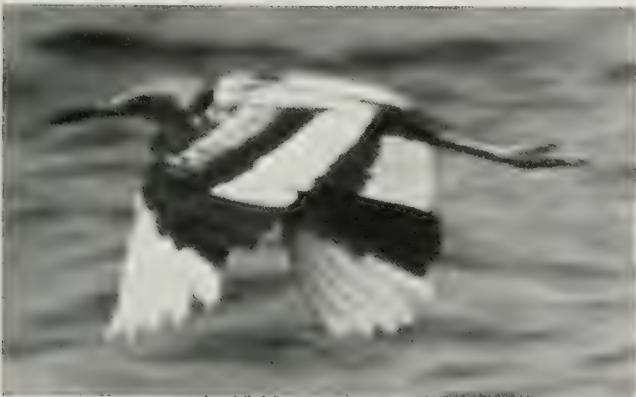


Fig. 20.—Subadult little blue heron in mixed white and blue (calico) plumage (see Table 6). Photograph by Glen C. Sanderson.

the smallest (mosquitofish), 1.5 cm. Frogs and crayfish are the only other important items in the sample. The items in Table 7 represent a very small and hastily gathered sample from a small area in the colony. Plans for a more representative collection were thwarted by the abandonment of the heronry in 1976. The diet listed in Table 7 is not grossly different from that listed by Hanebrink & Denton (1969) for little blue herons in a colony at Luxora, Arkansas, but is

TABLE 7.—Food<sup>a</sup> of nestling little blue herons on the Mississippi River near Commerce, Missouri.

Food Item	Number	Wet Weight (Grams)	Percent of Weight
<b>Invertebrates</b>			
Crayfish—Cambaridae	18	32.3	9.4
<i>Orconectes</i> sp.	3		
<i>Orconectes immunis</i>	13		
<i>Procambarus acutus</i>	1		
<i>Cambarellus</i> sp.	1		
Insects	20		
Dragonflies—Odonata	1 larva & 7 adults	0.2	
Bug—Hemiptera	1		
Belostomatidae ( <i>Lethocerus</i> )	1		
Notonectidae ( <i>Buenoa</i> )	1		
Beetles—Hydrophilidae	9 larvae		
<b>Vertebrates</b>			
Fish—Pisces	221	240.2	69.7
Gizzard shad ( <i>Dorosoma cepedianum</i> )	69	65.0	18.9
Grass pickerel ( <i>Esox americanus</i> )	1	2.9	0.8
Carp ( <i>Cyprinus carpio</i> )	81	48.0	13.9
Golden shiner ( <i>Notemigonus crysoleucas</i> )	16	21.0	6.1
Bigmouth buffalo ( <i>Ictiobus cyprinellus</i> )	13	17.5	5.1
Mosquitofish ( <i>Gambusia affinis</i> )	8	1.3	0.4
White bass ( <i>Morone chrysops</i> )	2	13.4	3.9
Flier ( <i>Centrarchus macropterus</i> )	3	1.1	0.3
Sunfish ( <i>Lepomis</i> sp.)	3	1.9	0.5
Warmouth ( <i>L. gulosus</i> )	16	42.9	12.4
Green sunfish ( <i>L. cyanellus</i> )	5	18.4	5.3
Orangespotted sunfish ( <i>L. humilis</i> )	2	5.7	1.6
Bluegill ( <i>L. macrochirus</i> )	1	0.9	0.3
White crappie ( <i>Pomoxis annularis</i> )	1	0.2	0.1
<b>Frogs—Salientia</b>			
Leopard frog ( <i>Rana utricularia</i> )	16	72.0	20.9

<sup>a</sup> Regurgitated boluses were collected under nests 30 June and 7 July 1975.



less varied. Little blues feed entirely in shallow waters, and lagoons, marshes, and swampy areas are vital to their survival.

## Plumages

The little blue heron is distinguishable in juvenile, first year, and adult plumages. The dark slate tips of the primaries (Fig. 18) readily separate the juvenile little blue heron from the all-white juvenile cattle egret (Fig 25) and the snowy egret. In the spring of the year following hatching, the white plumage is replaced in patches over the body, producing a "calico" bird (Dusi 1967, Fig. 20). By the second breeding season, the slatey blue plumage with purplish mantle is assumed.

## CATTLE EGRET (*Bubulcus ibis*)

(Fig. 21 and 22)

### Spring Migration

In Illinois a few cattle egrets may arrive as early as March, but most appear in mid- or late April (Fig. 23). The earliest arrival date for this species in northern Illinois is 4 April at Joliet (Fawks 1967a). The earliest arrival in central Illinois is 9 March at Banner, Fulton County (Princen 1975), whereas in southern Illinois the earliest the cattle egret has been reported is 27 March at East St. Louis (Kleen 1976b). One would expect earlier arrival in southern Illinois than farther northward, and peak numbers of cattle egrets appear slightly earlier in the south (the third week of April) than in other portions of the state (Fig. 23).

Cattle egrets are noted for overmigrating and appearing far northward of their known breeding grounds. Palmer (1962) says that the migration is probably diurnal. No observations of the migration of cattle egrets in Illinois have been reported.

### Distribution

Before 1930 cattle egrets were found chiefly in southern Spain, Portugal, and Africa. In the 1930's they established themselves in northern South America and spread from there to Florida in the 1940's. The first reported nesting for North America was in Florida in 1953 (Crosby 1972). The rapid establishment of breeding colonies of the cattle egret up the eastern coast and along the Gulf Coast and thence along waterways to the interior is shown in Fig. 21.

The cattle egret was first reported in Illinois by C. Clark and R. Pringle on 10 August 1952 at Sag-anashke Slough in southeastern Cook county (Nolan 1952). There were few reports of this bird in the state until 1962, when the first evidence of nesting in Illinois was observed (Anderson 1962b, Comfort 1962). Since then, the number of observations

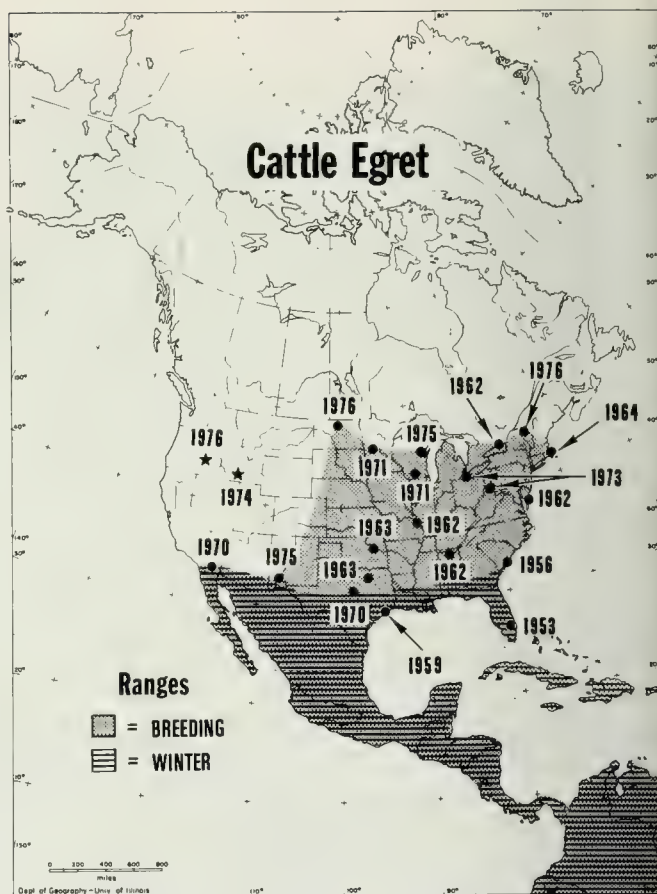


Fig. 21.—General distribution of the cattle egret. The species also has a broad distribution in the Old World. Dates (dots) indicate extension of nesting range in the USA since 1953.

of the cattle egret in Illinois has increased yearly, and the bird has now been reported in at least 55 counties (Fig. 24), including Kane County for which no specific locality was given (Kleen & Bush 1971b). However, nesting has been observed only in St. Clair (Wrischnik 1973), Monroe (Comfort 1962, Fleig 1971), and Will (Kleen & Bush 1971c) counties (Fig. 24). In 1975 a large number (300 pairs) nested on Billings Island (Scott County, Missouri) in the Mississippi River less than 1 km from the Illinois state line (about 2 km west of Willard, Alexander County).

### Nesting Habitats and Populations

The known number of breeding cattle egrets in the state at present is less than 100 birds annually, but some rookeries of the species probably have not been found. Colonies may exist near Belleville, in Oakwood Bottoms in Jackson County or on the Mississippi River nearby, around Horseshoe Lake in Alexander County, along the Illinois River from Meredosia to Lacon, and in extreme southeastern Lake County, since cattle egrets have been seen in these areas during the breeding season.

Palmer (1962) says that the cattle egret tends to



Fig. 22.—Adult cattle egret, a small (about 40 cm tall), white heron, which has become established in Illinois only in recent years. Note aigrette plumes on the back. In breeding season, adults have patches of buff on the front and back.



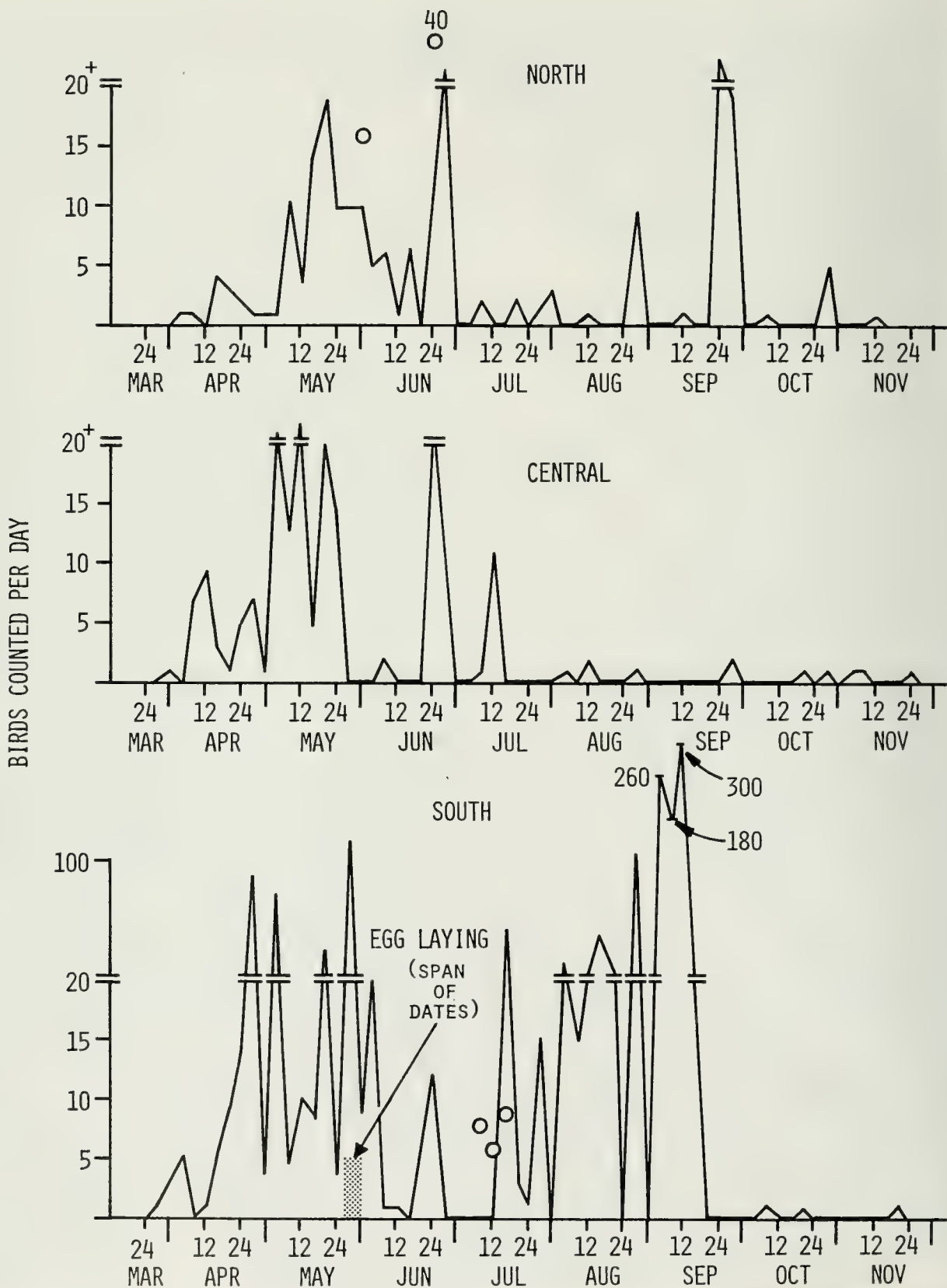


Fig. 23.—Migration seasons of the cattle egret in different regions of Illinois, as indicated by the highest recorded counts of all observers. Circles represent counts made at nesting colonies.

# Cattle Egret

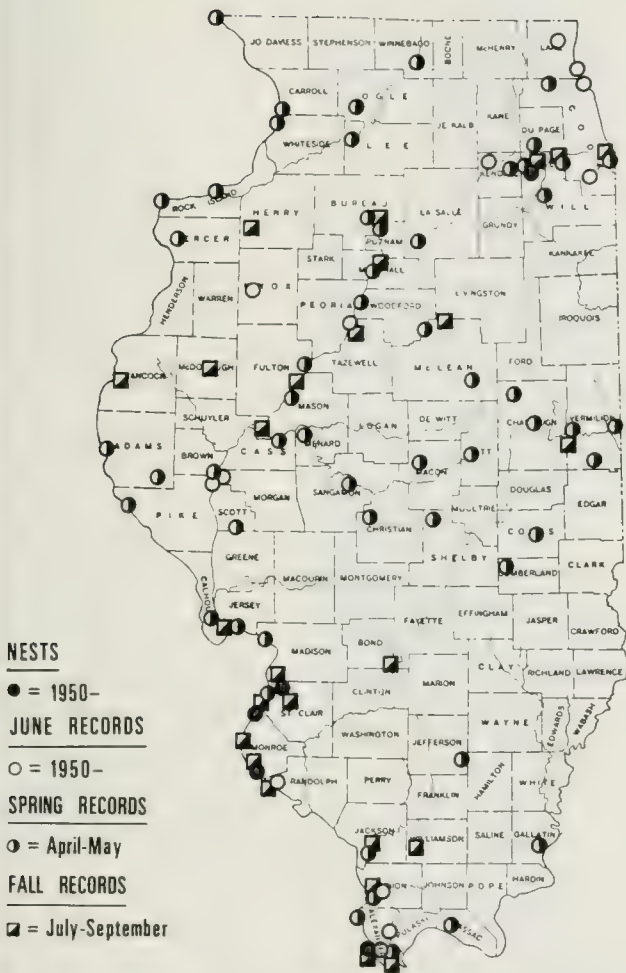


Fig. 24.—Distribution records of the cattle egret in Illinois.

nest with other herons when colonizing new areas. In every case thus far in Illinois, it has been found nesting with other heron species. At Lake Renwick (Will County) cattle egrets have nested with great egrets, black-crowned night herons, and green herons. At the Comment Sanctuary (St. Clair County), they have nested with great egrets, black-crowned night herons, little blue herons, and snowy egrets. On Billings Island cattle egrets were nesting with little blue herons and black-crowned night herons.

Nests of cattle egrets were placed 3–6 m up in small to medium-sized box elders on a small island in Lake Renwick. At Billings Island the nests were situated in crotches 1–5 m up in young black willows, which grew in a thick stand on this sandbar island. At the Comment heronry, nests were placed in small (10–36 cm DBH) ashes, elms, hawthorns, persimmons, and pin oaks. At the time we visited this heronry, the herons were gone; so it was impossible

to tell which nests had been occupied by which species. This heronry lies in a small low-lying woodlot surrounded by roadways leading to nearby St. Louis. At Lake Renwick and at Billings Island the cattle egrets were generally found nesting on the periphery of the rookeries.

## Nesting Cycle

No observations on the nesting cycle of the cattle egret in Illinois have been published. The following description of the events in the cycle and their timing are from studies made in Florida (Palmer 1962). Pair formation takes 2–3 days and nest building 4–7 days though material may be added to the nest throughout incubation and even after the eggs have hatched. A clutch of four or five eggs is laid. Incubation lasts 23 days and starts with the first egg so that the eggs hatch over a period of days. Both sexes incubate. The young are fed by both parents and spend about 30 days in the nest. At 40 days, young cattle egrets can fly short distances, and by 50 days can fly fairly well. Thus, the nesting cycle from the beginning of nest building to the independence of the young requires about 90 days.

The only clues we have as to the seasonal timing of the nesting cycle of the cattle egret in Illinois are from observations and photographs made at the heronry on Billings Island. On 7 July 1975 the young at this colony appeared to be between 15 and 18 days of age, judging from their behavior, size, and feathering (Fig 25). These birds must have hatched between 19 June and 22 June from eggs laid 27 May–30 May, the start of the nesting cycle (courtship) beginning in mid-May or earlier. Sometimes nest building is delayed by inclement weather (Palmer 1962). The cattle egrets appear to be later in nesting than are black-crowned night herons in the same heronries. At Lake Renwick on 26 June 1972, we found that black-crowned night herons had young 25–30 days old, whereas the cattle egrets appeared to be incubating. On 7 July 1975 at Billings Island, all of the black-crowned night herons had fledged young, while the cattle egrets still had young in the nests. The later nesting of the cattle egret has been noted in the literature (Kibbe 1976), and this characteristic may be helpful in enabling the species to colonize in more northern localities as well as to avoid nesting losses from early spring storms.

There are few data on productivity or nesting success in Illinois. Five young were produced in two nests at Lake Renwick in 1971 (Kleen & Bush 1971c). There were 22 young counted in a sample of 12 nests at Billings Island on 7 July, but at this date some of the older young might already have left the nests. Numbers of cattle egrets counted in the annual censuses of the Comment heronry near Caseyville, Illinois, vary from 2 to 9 adults and 0–20 young (Wrischnick





Fig. 25.—Young cattle egret just out of its nest. Note white tips of the primaries, a character distinguishing young cattle egrets from young little blue herons (Fig. 18).

1973 and 1975–1976, Kleen 1974–1975 and 1976–1977). Productivity can not be calculated from these data, as they do not account for adults away from the colony at the time the census was made, for adults that may have left after an unsuccessful attempt at nesting, or for postbreeding birds coming into the colony from farther south.

### Fall Migration

From these observations, it appears that the cattle egret nesting cycle in southern Illinois is probably finished by late July and the young are able to leave the heronries by mid-August. Anderson (1962c) wrote that cattle egrets had left the St. Louis area by the last of August in 1962. The departure of breeding birds and their young may be obscured by late summer influxes of cattle egrets from other areas, swelling the population to peak numbers in early September along the Mississippi River from St. Louis southward, e.g., 300 seen 12 September 1970 (Anderson 1971b, Petersen 1971) and 260 counted on 3 September 1973 (Kleen 1974a).

Cattle egrets have remained around the northern Illinois rookery at Plainfield until the last week in September in 1970, 1973, and 1974 (Fawks 1971a and 1974, Kleen & Bush 1973). Most cattle egrets leave Illinois by late September (Fig. 23), but a few may linger on. Late records for the north include five seen on 25 October 1974 near Opheim, Henry County (M. K. Mahoney unpublished) and one reported as far north as Indiana Dunes on 11 November 1971 (Petersen 1971). There are several November records for central Illinois: Vermilion County (near Homer)—3 November 1975 (Kleen 1976a); Mason County—8 November 1975 (Kleen 1976a); near Lacon—10 November 1968 (Princen 1969); and Hamilton—23 November 1974 (H. D. Bohlen un-

published). The latest record for the species in Illinois is one seen at Lake Carlyle, Bond County, on 7 December 1975 (Kleen 1976a). The number of reports of cattle egrets remaining late in Illinois in 1975 may have been due in part to the fact that the temperature throughout November of that year was

TABLE 8.—Regurgitated food items collected from cattle egrets at Billings Island heronry on 3 June and 7 July 1976.

Food Item	Number	Wet Weight (Grams) *	Percent of Weight
Invertebrates			
Molluscs			
Slug—Limacidae			
( <i>Deroceras reticulatum</i> )	1		
Insects			
Orthoptera			
Pigmy locusts			
( <i>Tettigidea lateralis</i> )	53	3.7	0.7
Short-horned grasshoppers			
( <i>Melanopus</i> )	221	47.0	8.9
Slant-faced grasshoppers—			
Acridinae	249	28.0	5.3
Band-winged grasshoppers—			
Oedipodinae	24	3.3	0.6
<i>Dissosteira carolina</i>	2	0.9	
Katydids—Phaneropterinae	7	2.8	0.5
<i>Amblycorpha oblongifolia</i>	5	2.5	0.5
Cone-headed grasshoppers			
( <i>Neoconocephalus</i> )	15	2.3	0.4
Meadow grasshoppers			
( <i>Conocephalus fasciatus</i> )	351	44.7	8.5
Tree crickets			
( <i>Oecanthus nigricornus</i> )	4	0.3	
Ground crickets ( <i>Nemobius</i> )	675	43.8	8.3
( <i>Nemobius fasciatus</i> )	7	0.9	
Field crickets ( <i>Gryllus</i> )	12	7.6	1.4
Cockroach—Blattidae			
( <i>Ischnoptera deropiltiformis</i> )	1	0.1	
Hemiptera			
Negro bugs—Corimelaenidae			
( <i>Allocoris pulicaria</i> ) <sup>b</sup>	13		
Stink bugs—Pentatomidae	4	0.3	
Homoptera			
Leafhopper—Cicadellidae	1		
Cicadas ( <i>Tibescen</i> )	3	5.0	0.9
Coleoptera			
Ground beetles—Carabidae	48	4.0	0.8
<i>Calosoma calidum</i>	1		
<i>Calosoma scrutator</i>	1		
Rove beetle—Staphylinidae <sup>b</sup>	1		
Soldier beetles—Cantharidae			
( <i>Cauliognathus marginatus</i> )	7	0.8	
Ladybird beetles—Coccinellidae			
( <i>Coleomegilla maculata</i> )	8	0.4	
Scarab beetles—Scarabaeidae	27	20.0	3.8
Dung beetles ( <i>Aphodius</i> )	4		
Leaf beetles—Chrysomelidae			
( <i>Chrysomela scripta</i> )	1		
( <i>Myochrous denticollis</i> )	2		
( <i>Oedionychis vians</i> )	1		
Snout beetles—Curculionidae			
( <i>Baris</i> )	1		
( <i>Listronotus</i> )	1		
Beetle larvae	10	0.6	

(Table 8 continued on next page.)



Fig. 26.—Cattle egrets foraging among pigs in Gallatin County, 10 May 1972.



TABLE 8.—Continued

Food Item	Number	Wet Weight (Grams) <sup>a</sup>	Percent of Weight
Lepidoptera			
Measuring worm moths—Geometridae	2		
Butterfly larva—Pieridae ( <i>Colias eurytheme</i> or <i>philodice</i> )	1		
Moth larvae—Noctuidae		2.8	0.5
Cutworms ( <i>Agrotis ipsilon</i> )	20		
Clover-looping owlets ( <i>Caenurgina crassiuscula</i> or <i>erecta</i> )	2		
<i>Leucania</i>	1		
Green clover worms ( <i>Plathypena scabra</i> )	15		
Armyworms ( <i>Pseudaletia unipuncta</i> )	2		
<i>Spodoptera ornithogalli</i>	3		
Pyralidae	1		
Diptera			
Horseflies ( <i>Tabanus</i> )	53	4.0	0.8
<i>Tabanus atratus</i>	15	9.1	1.7
Robber flies—Asilidae	3	0.4	
Houseflies—Muscidae	5	0.1	
Blowflies ( <i>Phormia regina</i> )	158	4.0	0.8
Tachnid flies—Tachnidae	3	0.2	
Fly larvae	7	0.8	
Hymenoptera			
Wasp—Ichneumonidae (a lepidopteran larvae parasite) <sup>b</sup>	1		
Tiphiidae (a beetle larvae parasite) <sup>b</sup>	1		
Ant—Formicidae ( <i>Camponotus</i> ) <sup>b</sup>	1		
Wasps—Vespidae	2		
Bee—Halictidae ( <i>Dialictus</i> )	1		
Insect larvae	4	0.2	
Arachnida		13.8	2.6
Wolf spiders—Lycosidae	8		
<i>Arctosa rubicunda</i>	1		
<i>Lycosa avida</i>	32		
<i>Lycosa carolinensis</i>	15		
<i>Lycosa helluo</i>	1		
<i>Pardosa saxatilis</i>	30		
<i>Trochosa terricola</i>	1		
Egg cases	4		
Vertebrates			
Amphibians			
Toad ( <i>Bufo woodhouseii</i> )	39	162.9	30.9
Frog—Hylid	1		
Mammals			
Rodents			
Vole ( <i>Microtus ochrogaster</i> )	3	90.0	17.1
House mouse ( <i>Mus musculus</i> )	1	20.0	3.8
Total		527.3	98.8

<sup>a</sup> Wet weight of preserved specimens.<sup>b</sup> Very small items came from toad stomachs, the toads having been eaten by egrets, and from being on host species eaten by egrets.

3°–5° C above average (U.S. Department of Commerce, Environmental Data Service 1975–1976).

## Food

The cattle egret's habit of foraging among cattle, horses (Comfort 1962), hogs (Mumford 1961b, Fig. 26), and even white-tailed deer (M. Morrison unpublished) has given the species its common name. It

has been assumed that the cattle egret eats ticks from its grazing associates, and in some localities it has been called the "tick bird." However, studies of the food habits of the cattle egret (Fogarty & Hetrick 1973, Jenni 1973) indicate that ticks constitute very little of its food. We found no ticks in the food samples we examined (Table 8). It appears that these small herons are interested in the insects stirred up by the cattle as they move around grazing, and the egrets have been observed to leave resting animals to follow those moving about (Hanebrink & Denton 1969). They may also get flies (especially Tabanidae) from livestock, as flies are a regular item in the cattle egret's diet.

The cattle egret is also often seen foraging on its own, away from livestock, in low meadows, pastures, roadside ditches, and on the grassy margins of shallow bodies of water. The major portion of its food appears to be insects, especially Orthoptera (grasshoppers, crickets, and katydids). Diptera (flies), ground beetles, insect larvae, slugs, and spiders are also eaten in considerable numbers. A number of toads and four mammals (voles and a house mouse) were found in regurgitated food boluses at the heronry on Billings Island (Table 8). Our list of food items for the cattle egret agrees fairly well with that given by Hanebrink & Denton (1969), who made a similar study at a heronry at Luxora, Arkansas.

The cattle egret's diet indicates that it competes very little with most other herons for food. When cattle egrets and little blue herons were observed feeding at the same lagoons, the cattle egrets were seen searching the low-lying vegetation on the shore, whereas the little blue herons were feeding in the water. The diet of the snowy egret, as indicated by studies made in other states, appears to be somewhat like that of the cattle egret and somewhat like that of the little blue heron. Since cattle egrets have been observed outside of Illinois competing with the snowy egret for nesting sites (McCaskie 1973), it may be that the cattle egret will provide serious competition for this species.

## REDDISH EGRET

### (*Dichromanassa rufescens*)

Reddish egrets infrequently reach southern Illinois in late summer. Nelson (1876) wrote that they were "common" (but wary and remained apart from other herons) in lagoons and marshes about Cairo, Illinois, in the latter half of August, 1875. This record, if accurate, is remarkable, as all other references to this species indicate that it is rare in Illinois. Nelson also mentioned unusually high water for the season.

J. E. Comfort reported seeing a reddish egret in Illinois at Chain-of-Lakes bridge (St. Louis) on 29

July 1949 (Comfort 1949, Mayfield 1950a). Another sight record for the species in this area was one seen by A. Bolinger (and later seen by J. E. Comfort) on 30 September 1951 in marshes in St. Charles County, Missouri (Comfort 1951).

## GREAT EGRET (*Casmerodius albus*)

(Cover, Fig. 27 and 28)

### Spring Migration

Great egrets do not generally begin to appear in Illinois until March even in the south (Fig. 29). Early arrival dates are 9 March in central Illinois (Nolan 1955a) and 17 March in the north (Brown 1963a), but the species is not usually detected in Illinois until after 20 March. The migration may last into May or even early June (Fig. 29). Actual migration flights have apparently never been observed.

### Distribution

The great egret has a nearly worldwide range, and though primarily southern in distribution in the United States, it comes well north (e.g., Minnesota and Canada) along major rivers and both coasts (Fig. 28).

In Illinois, as elsewhere, the distribution has followed the enormous ups and downs of the general population (see under breeding population). The great egrets' occurrence in the Illinois area dates at least to about 1200 AD (Parmalee 1957), but there is no way to tell whether such a record refers to breeding birds, migrants, or both. The present breeding distribution, similar to that of the great blue heron, is mainly along the large rivers (Fig. 30). The great egret, compared with the great blue, has been an infrequent constituent of Indian middens, but six bone specimens of the egret were found at Cahokia (Parmalee 1957).

### Nesting Habitats and Populations

The great egret nests almost invariably with other species of herons, particularly great blues, black-crowned night herons, or both. We know of no Illinois colony that consisted solely of great egrets. Egrets often place their nests in the trees that have great blue nests (see Table 2), but in the Pekin colony, where great blues used principally cottonwood trees, the egrets used more silver maples (Bjorklund 1975). Bjorklund (1975) and Hammerslough & Bjorklund (1968) also pointed out that great egret nests were generally placed lower (15–18 m high) than nests of great blues (18–24 m high) in the same colony. Egrets show much more flexibility than great blues in their choice of nest sites, as evidenced especially by birds in colonies at Plainfield and East St. Louis, Illinois, and Commerce, Missouri. At these places

great blues were absent, and there was neither extensive forest nor large trees, but great egrets nested there among smaller herons at heights below 9 m. However, in Illinois many more great egrets nest with great blues than with the smaller herons only.

The foraging habitat of the great egret has not been precisely defined. In the nesting season we have seen them fishing most often in lagoons of the floodplains of the major rivers within 9.6 km of the colony. If there is a consistent difference in the foraging habitat of this species from that of the great blue, it has not been determined, and they often fish at the same lagoon. Strangely, there are no data on preferred water depths of either species. Stewart (1949) stated that they require clear water.

In considering any population of migratory birds, it is important to differentiate between the local breeding population and the migrant population that passes through an area or a population that uses the area for reasons other than nesting. A number of species of herons exhibit a special migration pattern, in which, after the nesting season, they first move north (sometimes hundreds of kilometers), where they spend the rest of the summer and fall, before migrating back south for the winter. There are, thus, two summer populations in Illinois—(1) the Illinois breeding population, which arrived in spring, and (2) a population that arrives in summer from the south, where nesting starts and finishes much earlier than in Illinois. Coffey's (1943) data on great egrets banded in spring as juveniles in Mississippi and recovered (five birds) in Illinois mainly in July and August clearly illustrate the pattern of northward movement.

Within historic times, great egret populations in Illinois have undergone at least one major decline and a major expansion, and the breeding population is now declining again. The species was abundant in Illinois well into the 19th century (Barnes 1926), nesting at least as far north as the Kankakee valley (Woodruff 1908, Butler 1934). The onset of the great egret's decline is not precisely dated, but by 1890 both the breeding and visitant populations were seriously depleted, and the decline was attributed to plume hunters (Barnes 1912 and 1926, Woodruff 1908). The breeding population was gone from the central Mississippi and Illinois valleys by about 1900 (Barnes 1912 and 1917, Widmann 1907). The U.S. population of great egrets probably reached its low point in the early 1900's (Bent 1926, DuMont 1935), and there were few records of the species in Illinois between 1900 and 1925. By 1916 the selling of egret plumes was illegal in Illinois (Lucey 1916), and strong opposition to the persecution of egrets and other birds was developing nationwide. It was an important landmark in the history of conservation, showing that the tides of destruction can be turned.

Great egrets began to return to Illinois rivers,





Fig. 27.—Great egret at a nesting colony near Plainfield. The largest (about 80 cm tall) white heron in Illinois, it has a yellow or orangy bill and black legs. Note aigrette plumes on the back, characteristic of the adult in breeding season.



# Great Egret

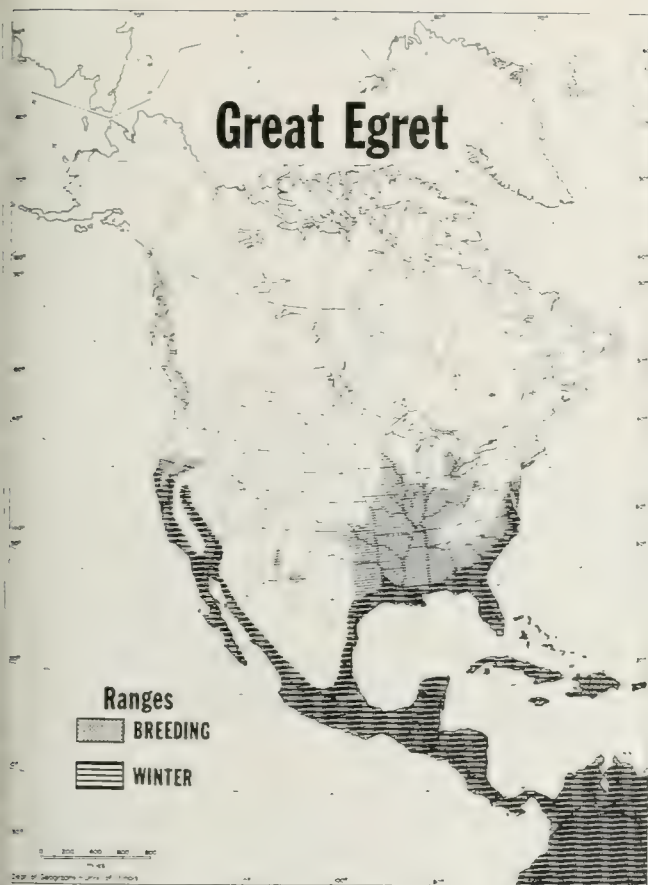


Fig. 28.—General distribution of the great egret. The species is also widely distributed in the Old World.

at first only as nonbreeding summer visitants. At Quincy, Musselman (1932b) saw the egret population climb notably after 1927. In the Mississippi valley north of St. Louis, Jones (1937b) reported the first egret nesting for the area in 35 years, and farther north on the Illinois River in 1938 Bellrose (1939b) found nesting great egrets near Peoria. By at least 1941 great egrets were nesting on the Mississippi in northern Illinois (DuMont & Smith 1946). The increase, both of the nesting and visitant populations, continued at least into the 1950's (Mayfield 1948, Nolan 1954b). Now (1970's) the Illinois nesting population appears to be declining, with many colonies being abandoned (Fig. 30). The seriousness of the decline is indicated by the recent counts of great egret nests in the state (Table 9). The counts of great egret nests censused in both 1973 and 1976 were 407 and 81, respectively—a decline of about 80 percent (27 percent per year). Not all colonies were censused in both 1973 and 1976, and if we use counts for consecutive years to obtain a more complete record, the number of nests for 1973 (plus data for four colonies in 1974) and 1976 were 455 and 91—also a decline of about 80 percent. In making this calculation, we had to exclude the number of great egret nests in col-

onies at East St. Louis, Old Monroe, Commerce, Grand Island, and Plainfield because counts were lacking for one or both sets of years. The Comment Sanctuary of East St. Louis was censused for birds, but not for nests, by members of the Southwest Chapter of the Illinois Audubon Society. If we use the number of adult great egrets as an index to number of nests, we estimate about 45 nests in 1973 and 5 in 1976. Other colonies not accounted for in the above totals were: Old Monroe, which had 25 nests in 1975 and none in 1976; Commerce, which had 1 nest in 1975 and none in 1976; Grand Island, which had 15 in 1975 and 10 in 1976; and Plainfield, which had 15 nests in 1973 (no data for 1976). These colonies account for an additional 101 nests, making a total of 556 great egret nests in the state in recent years (1973–1975), but not more than 106 (plus the Plainfield colony) in 1976. The record for 1977 is very incomplete but not encouraging as far as the egret population is concerned, as most of the counts that we do have are below the 1976 level.

The problem of evaluating the census data for the 1970's or any other short period involves not only the question of the accuracy of the census, but that age-old problem for biologists of a lack of long-term data on the "natural" fluctuations of wild populations. An 80-percent change in one direction over such a large area in 4 years seems excessive, but a number of high years could bring the population up as it did 40 years ago. Individual colonies have shown enormous variation. Harlan (1943 and 1945) saw the number of great egret nests at Sabula fall from 250 to 0 in 3 years. The number of nests at New Boston dropped almost as much between 1955 and 1957, but by 1963 was back to 100 nests and was down again to 25 by 1976 (Table 9). The nesting population of great egrets in the Illinois valley, 1958–1964, showed a strongly fluctuating pattern—375 nests in 1958, 640 in 1962, and 305 in 1964 (Mills et al. 1966). The range of variation is more than would be expected from natural mortality and productivity, given average mortality rates (76 percent for first year birds and 26 percent for older birds) for great egrets in the United States (Kahl 1963). The statewide counts (Table 9) also show more loss than would be expected from natural mortality, and it seems likely that the changes involve some movement. Though there is no proved case (based on banded birds) of the movement of a colony *en masse* to a new site, the case of the population at Grand Marais (Frank Holten) State Park is suggestive of such a move. When the nest trees in the park were cut in 1963, the birds abandoned the area, but by at least 1967 a similar population appeared only about 1½ miles away (Wrischnik 1973).

The decline of egrets in the last century was virtually continentwide, but, as yet, changes (if any)



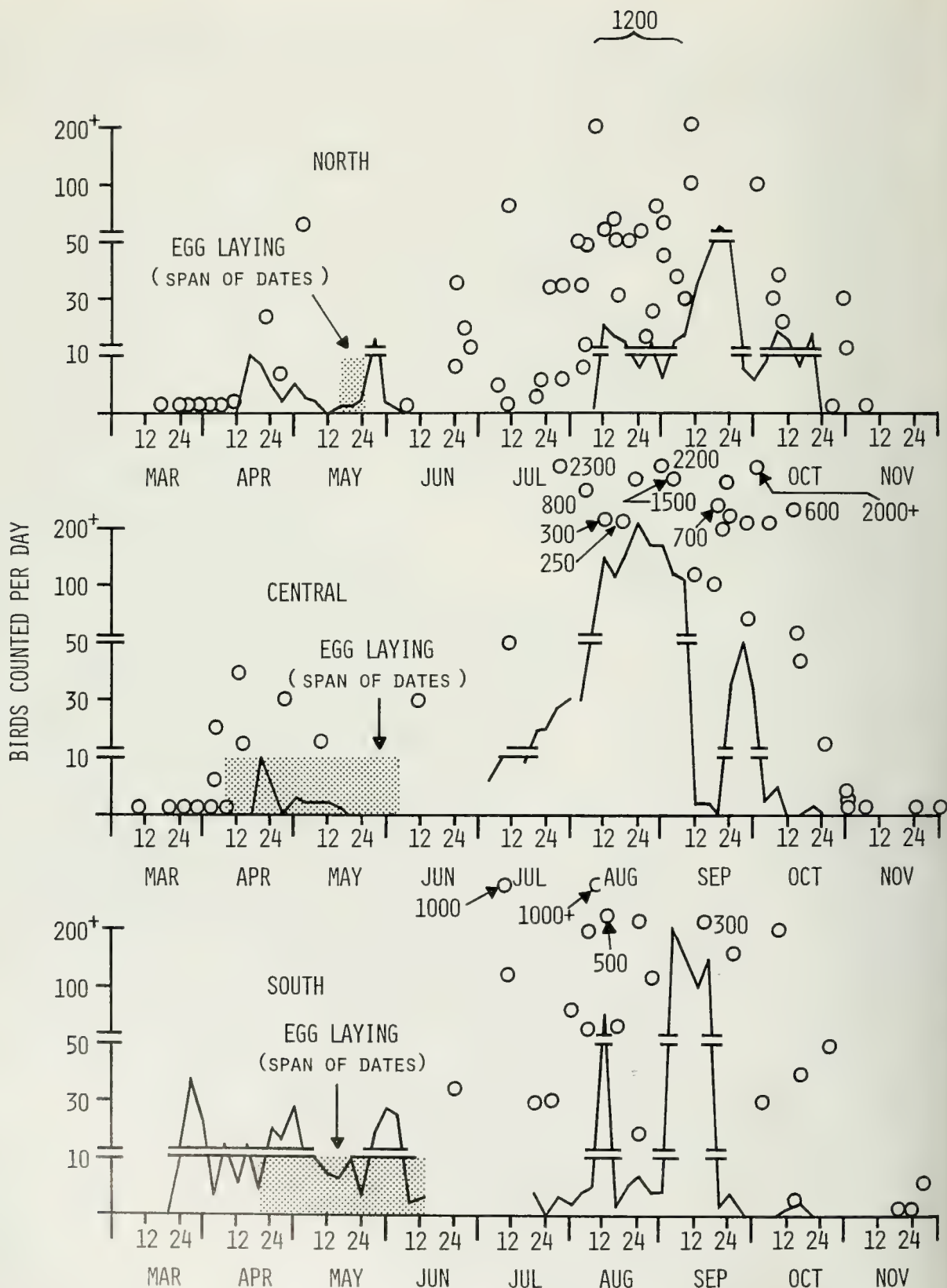


Fig. 29.—Egg-laying and migration seasons of great egret in different regions of Illinois. Spring and fall graph lines represent the highest daily count of each 4 days (1967–1970). Circles represent counts made in other years or by other observers. Shaded areas show the span of dates during which egg laying has been recorded.

# Great Egret



Fig. 30.—Distribution of nesting colonies of great egrets in Illinois. Encircled colonies were apparently abandoned by 1976-1977.

in the total continental population are apparently unknown.

We have some evidence that egrets are showing indications of hydrocarbon pollution (see also the introduction and the great blue heron account). A total of 47 measurements of the shells of nine great egret eggs, presumed to have hatched, from the Hamburg colony showed a range of shell thickness of 190-289 microns and a mean of 252 (SE = 3.61). This mean was thinner than that of pre-1947 eggs (mean: 295 microns) and was about comparable to the thickness of recently measured great egret eggs from California (range of means: 244-272 microns, Faber et al., 1972).

## Nesting Cycle

The nesting cycle of the great egret is poorly known in general (Palmer 1962), and there are very

few Illinois data. Anderson (1963a) recorded the arrival of 15 great egrets at a colony site at East St. Louis by 31 March with 31 of 50 nests occupied by 7 April. Farther north at Rock Island, Hodges (1953) found the first birds in the colony on 5 April.

Nest building by egrets and night herons was noted by Galbreath (1962) at East St. Louis on 5 May. We have seen egrets carrying sticks to the nest as late as 30 June at Hamburg, but we presumed this to be refurbishing, not initial building. The time required for nest building is unknown.

The eggs are pale blue or greenish blue, often more richly colored than great blue heron eggs. Laying frequency and clutch size are unknown for any Illinois population. We have estimated the egg-laying period to extend from at least 20 April to 14 June in southern Illinois (Fig. 29), based on fledging dates and an incubation period of 25 days and nestling life of 42 days (Palmer 1962). The 14 June date was based on hatching observed on 9 July 1975. In central Illinois, Bjorklund (unpublished) detected egg laying as early as 5 April.

At East St. Louis fledged young have been seen as early as 14 July (Galbreath 1962), and young still in the nest as late as 14 August (Mumford 1960a). In northern Illinois we've seen birds in nests on 1 August but do not know how much later they remained.

Hatching rate, nesting success, and productivity are not known for any Illinois population and are badly needed to help interpret the falling population. Our best counts (from the ground) of well-grown young at 188 nests throughout the state between 1973 and 1976 were 2.5 and 2.2 per nest (for sources of error in this type of data, see under great blue heron). From mortality data on great egrets in the USA, Kahl (1963) calculated that 2.9 young per pair are needed to maintain a population.

Near Rock Island, Hodges (1950) noted signs of molting, including the loss of plumes, by 19 June, but the molt was much more evident on 16 July. Near Peoria, Bellrose (1939b) observed that the egret's plumes were badly worn by 8 July and completely gone (molted) by 27 July. At Sabula, Harlan (1943) noted large numbers of shed plumes on 30 July. The duration of the molt has not been recorded.

## Fall Migration

The arrival of great egrets in summer, mainly from the south (Coffey 1943), is often conspicuous because of the pronounced population increases. Whether birds breeding in Illinois also move northward after breeding is not established, but the history of a bird banded as a fledgling on 3 July 1963 at Pekin and recovered on 1 November 1965 at Zion is suggestive of such movement (Bjorklund & Canterbury 1971). The postbreeding flights carry some



TABLE 9.—Great egret colonies in Illinois and adjacent areas.

Colony Site	County	Year	Number of Nests	Reference	Recent Counts of Nests				
					1973	1974	1975	1976	1977
Mississippi River Area									
Sabula, Iowa	Jackson	1941	10	DuMont & Smith (1946)					
Sabula, Iowa	Jackson	1942	10	DuMont & Smith (1946), Hodges (1947)					
Sabula, Iowa	Jackson	1943	250	Harlan (1943)					
Sabula, Iowa	Jackson	1944	"small number"	Harlan (1945)					
Sabula, Iowa	Jackson	1945	0	Harlan (1945)	...	4	2	10 <sup>a</sup>	...
Clinton	Whiteside	1966	2	W. H. Brown (1966)	...	0	0	0	...
Iowa (location?)	Scott	1948	P <sup>b</sup>	Mayfield (1948)					
Andalusia	Rock Island	1948	P?	Hodges (1950)					
Andalusia	Rock Island	1949	25 <sup>c</sup>	Hodges (1950)					
Andalusia	Rock Island	1950	Fewer than in 1949	Hodges (1950)					
Andalusia	Rock Island	1965	P	Petersen & Ward (1966)					
Andalusia	Rock Island	1966	50 <sup>c</sup>	Petersen & Ward (1966)	0	0	3	0	0
Iowa (location?)	Muscatine	1948	P	Mayfield (1948)	0	0	0	0	...
Iowa (location?)	Louisa	1948	P	Mayfield (1948)	0	0	0	0	...
New Boston	Mercer	1955	250 <sup>c</sup>	Greer (1955)					
New Boston	Mercer	1956	200 <sup>c</sup>	Nolan (1957)					
New Boston	Mercer	1957	30 <sup>c</sup>	Nolan (1957)					
New Boston	Mercer	1958	P	Nolan (1958b)					
New Boston	Mercer	1959	50	Mumford (unpublished)					
New Boston	Mercer	1960	P	Mumford (1960c)					
New Boston	Mercer	1962	67	Brown (1962)					
New Boston	Mercer	1963	100	Brown (1963b)	50	25	5	15	25
Burlington, Iowa	?	1942-1943	P (2 years)	Musselman (unpublished)					
Skunk River, Iowa	Des Moines	1948	P (4 colonies)	Mayfield (1948)	20	4	0	0	...
Quincy area	?								
McDonald Island	Adams	1948	150	Musselman (unpublished)	20	0	0	0	...
Atlas	Pike				0	0	0	0	...
Boyd Island	Pike	1941	P	Jenkins (1942)	...	40	4	0	...
Clarksville No. 1, Mo.	Pike	1942	P	Jenkins (1942)	0	0	0	0	...
Clarksville No. 1, Mo.	Pike	1942	P	Jenkins (1942)	0	10	0	0	0
Clarksville No. 2	Calhoun	1942	100	Cunningham & Spotswood (1942)	150	190	75	35	10
Hamburg	Calhoun								
Miss. R. Islands, Mo. (location?)	Lincoln	1900	P	Widmann (1907)					
Miss. R. Islands, Mo. (location?)	St. Charles	1900	P	Widmann (1907)					
Old Monroe, Mo.	St. Charles				...	...	25	0	...
Marais Temps Clair, Mo.	St. Charles	1935	1	Jones (1937b)					
Alton	Madison?	1941	12	Cunningham (1941)					
Grand Marais (East St. Louis)	St. Clair	1958	15	Nolan (1958b), Comfort (1958b)					
Grand Marais (East St. Louis)	St. Clair	1959	25-30	Comfort (1959), Mumford (1959)					
Grand Marais (East St. Louis)	St. Clair	1961	25-50	Comfort (1961b), Galbreath (1961)					
Grand Marais (East St. Louis)	St. Clair	1962	43	Anderson (1962a and b)					
Grand Marais (East St. Louis)	St. Clair	1963	50	Anderson (1963a and b)					
Grand Marais (East St. Louis)	St. Clair	1964	P	Anderson (1964a)	0	0	...	...	...

(Table 9 continued on next page.)

Colony Site	County	Year	Number of Nests	Reference	Recent Counts of Nests				
					1973	1974	1975	1976	1977
East St. Louis (Comment Sanctuary)	St. Clair	1964	P	Wischnik (1973)					
East St. Louis (Comment Sanctuary)	St. Clair	1967-1976	P	Wischnik (1973, 1975-1976), Kleen (1974-1975, 1976-1977)					
Fults	Monroe	1971?	P	Fleig (1971)	0	40	40	5	0
Wolf Lake	Union	1950	P	Lopinot (1950)	0	0	0	0	...
Ware	Union				100	80	10	1	0
Commerce, Mo.	Scott				...	...	1	0	...
Illinois River									
Depue	Bureau	1941	25	Smith (1941)					
Depue	Bureau	1942	P	Bartel (1943)					
Depue	Bureau	1946	20	DuMont (1947 <i>b</i> )					
Depue	Bureau	1947	50	DuMont (1947 <i>b</i> )					
Depue	Bureau	1958	250	Bellrose (unpublished)					
Depue	Bureau	1962	300	Bellrose (unpublished)					
Depue	Bureau	1964	120	Bellrose (unpublished)					
Depue	Bureau	1967	140	Bellrose (unpublished)	20	15	15	10	1
Depue	Bureau	1890	P	Barnes (1890 <i>b</i> )					
Depue-Hennepin area	Putnam?	1890	P	Barnes (1912)					
Hennepin Lake	Putnam	1907	6	Barnes (1909)					
Lacon (12 km south)	Marshall	1879	P	Barnes (1917)					
Marshall County (location?)	Marshall	?	P						
Chillicothe	Peoria?	1891	P	W. E. Loucks (unpublished)	...	1	1	0	0
Pekin	Tazewell	1958	125	Bellrose (unpublished)					
Pekin	Tazewell	1962	34	see Bjorklund (1975) for complete record					
Pekin	Tazewell	1967	128	Bjorklund (1975)					
Pekin	Tazewell	1968	49	Bjorklund (1975)					
Pekin	Tazewell	1972	58	Bjorklund (1975)	2	0	0	0	0
Big Lake	Fulton	1938	1	Bellrose (unpublished and 1939 <i>b</i> )	...	0	0	0	...
Clear Lake	Mason-Tazewell	1958, 1962	0	Bellrose (unpublished)					
Clear Lake	Mason-Tazewell	1964	110	Bellrose (unpublished)					
Clear Lake	Mason-Tazewell	1967	170	Bellrose (unpublished)					
Clear Lake	Mason-Tazewell	1968	327	Bellrose (unpublished)					
Clear Lake	Mason-Tazewell	1969	293	Bellrose (unpublished)					
Clear Lake	Mason-Tazewell	1971	82	Bellrose (unpublished)					
Clear Lake	Mason-Tazewell	1972	70	Bjorklund (unpublished)	30	...	29	15	36
Grand Island	Mason	1973	P	Bellrose (unpublished)	...	...	15	10	0
Metedosia	Cass	1973	P	Bellrose (unpublished)	...	0	0	0	0
Localities Other Than Mississippi and Illinois Rivers									
kankakee River, Ind.	Lake?	1907	P	Woodruff (1908)	...	...	...	...	0
Plainfield	Will	1961	P	Fawks & Lobik (1975)					
Plainfield	Will	1970	P	J. R. Sanders (unpublished)					
Plainfield	Will	1971	10	J. W. Olson (unpublished)	15	...	...	...	16
Willow Slough, Ind.	Newton	1953	10	Ginn (1954), Nolan (1953 <i>c</i> )					
Willow Slough, Ind.	Newton	1954	20	Nolan (1954 <i>b</i> ), Mumford (unpublished)					
Willow Slough, Ind.	Newton	1959	0	Mumford (unpublished)				0	...
Springfield, Sangamon River	Sangamon	1945	P?	DuMont & Smith (1945)	...	...	...	...	...
Hovey Lake area, Ohio River, Ind.	Posey	1945	P?	Skaar (1951)	...	...	...	0	...

(Table 9 continued on next page.)



TABLE 9.—Continued

Colony Site	County	Year	Number of Nests	Reference	Recent Counts of Nests				
					1973	1974	1975	1976	1977
Shobonier, Kaskaskia River	Fayette				0	1	0	0	...
Rend Lake, Big Muddy River	Jefferson				3	6	0	0	...
Grantsburg, Bay Creek	Johnson	1966	P	J. Schwegman (unpublished)					
Grantsburg, Bay Creek	Johnson	1969	0	J. Schwegman (unpublished)	0	0	0	0	...
Heron Pond, Cache River	Johnson	1969	22	J. Schwegman (unpublished)	12	0	0	0	...
Unionville, Ohio River	Massac				...	3	0	0	...
Number of nests counted, 1973–1976					423	419	225	101	
Number of colonies with egrets					11	10	13	8	

<sup>a</sup> Counts above 5 rounded to nearest 5.<sup>b</sup> Nests present but not counted.<sup>c</sup> Number calculated from author's data.

birds as far north as Canada. Before egrets bred commonly in Illinois, the appearance of the summer transients was especially conspicuous. Musselman (1933 and 1937) noted such arrivals at Quincy on 14 and 26 July. Nelson (1877) observed that egrets became common at Mt. Carmel by the last of July. Bellrose (1939a) noted the beginning of the influx—22 birds—on 3 July at the mouth of the Illinois River, and observed 120 egrets by 10 July.

There is great annual variation in these summer-fall flights not only in the numbers seen, but in the arrival and departure dates. Especially large flights were recorded in 1938 (Bellrose 1941) and 1947 (Cunningham 1948); the observation of 1,000 birds on 9 July 1947 at Cape Girardeau is early for such a number, but by 1 August several thousand were present. A high count of 2,300 birds on 28 July at Lake Chautauqua (Smith 1942b) also represents the influx of transients. These were presumably counts of foraging birds, but such counts at a single place do not usually exceed a few hundred birds in most years (Fig. 29). These flights may be diurnal at least in part. Both Robert Russell (see Mumford 1961c) and Peter Dring have observed northward flights of flocked egrets in August—one flock in "V" formation flying along the shore of Lake Michigan.

Egrets are very social and form communal roosts from the time of their first arrival in spring (Stewart 1949). The late summer roosts are particularly impressive, and counts at such locations may exceed 1,000 birds. Bellrose (1939a) estimated that about 7,000 great egrets roosted in the Illinois Valley at seven sites between Depue and Meredosia in 1938. The roosts were in bottomland forests, often near the nesting colony sites of great blues and night herons. One roost in the Mississippi Valley was in a button-bush marsh (Short 1938). Bellrose (1939a) saw the roosting population decline sharply in late September, and by 15 October only 45 birds were left at Chillicothe. The variation in our fall counts (Fig. 29) may represent annual rather than regional variation, but most egrets have migrated south of Illinois by the end of October. Relatively few linger into November or later, and they probably do not do so every year. Sarah Vasse reported November sightings of great egrets in 2 of 3 years in Calhoun County (Petersen 1964 and 1966a). The detailed characteristics of the fall migration are not known with certainty and may be different from those of the northward summer flights (see above). A departure of egrets from Calhoun County was noted to coincide with the passage of a cold front on 2 November 1963 (Anderson 1963–1964). Musselman (1932a) implied that the fall flights were nocturnal, probably on the basis of overnight population changes, but no fall migration flights of any kind had been witnessed.

The great annual differences in summer egret

populations have been attributed to weather. Stewart (1949) suspected that low-water years had high egret populations, but high transient populations in August have also been attributed to floods in July (Short 1942), and low populations to drought (Blake 1948a). Two notably high "egret years"—1938 and 1947—had very different weather except in June, when both had high precipitation. The factors that affect heron populations include all the factors that affect fish populations and their availability in Illinois and elsewhere. On 22 October 1956 on a flight over the Illinois and Mississippi rivers between Depue, St. Louis, and Rock Island, we counted about 1,300 egrets, nearly all in the Illinois Valley, which offered many more shallow lagoons than the Mississippi. In 1969 also—the only other year when we

made comparative counts—our (ground) counts were much higher in the Illinois than in the Mississippi Valley. There was also a marked difference in the egret population between western and eastern Illinois, even in the south where the Ohio and Wabash rivers might seem to provide habitat attractive to the birds. In the south we saw 4.4 great egrets in the west to 1.0 in the east in spring, and 30.5 to 1.0 in fall. The summer influx thus seems much more strongly associated with the Mississippi than with the Ohio drainage. East-central Illinois has probably the lowest populations of transient egrets compared with those of the west, with the ratio on the order of one in the east to several hundred in the west. We have no east-west ratio for northern Illinois, but would expect it to favor the west strongly. Eastern wetlands

TABLE 10.—Food collected from nestling great egrets at six Illinois heron colonies on the Mississippi and Illinois rivers 5 July–1 August 1973–1975.

Food Item	Number of Specimens			Total Specimens	Percent of Total	Estimated Weight of Food (Grams)	Percent of Weight
	Illinois River	Mississippi River					
	Depue	New Boston	Hamburg-Ware				
Crayfish ( <i>Orconectes virilis</i> )	0	0	2	2	0.4	14	1.0
Shortnose gar ( <i>Lepisosteus platostomus</i> )	0	0	2	2	0.4	20	1.4
Gar ( <i>Lepisosteus</i> species?)	0	0	2	2	0.4	55	3.9
Bowfin ( <i>Amia calva</i> )	0	0	1	1	0.2	25	1.8
Gizzard shad ( <i>Dorosoma cepedianum</i> )	23	39	278	340	71.0	850	60.5
Carp ( <i>Cyprinus carpio</i> )	0	0	20	20	4.2	100	7.1
Emerald shiner ( <i>Notropis atherinoides</i> )	15	26	0	41	8.6	37	2.6
Smallmouth buffalo ( <i>Ictiobus bubalus</i> )	0	2	0	2	0.4	4	0.3
Bigmouth buffalo ( <i>I. cyprinellus</i> )	0	13	12	25	5.2	75	5.3
Black bullhead ( <i>Ictalurus melas</i> )	0	0	1	1	0.2	4	0.3
Brown bullhead ( <i>I. nebulosus</i> )	0	0	2	2	0.4	16	1.1
White bass ( <i>Morone chrysops</i> )	0	18	0	18	3.7	36	2.6
Yellow bass ( <i>M. mississippiensis</i> )	0	0	4	4	0.8	8	0.6
Green sunfish ( <i>Lepomis cyanellus</i> )	0	0	2	2	0.4	2	0.1
Bluegill ( <i>L. macrochirus</i> )	0	2	4	6	1.2	27	1.9
Sunfish (species?)	1	0	0	1	0.2	2	0.1
Largemouth bass ( <i>Micropterus salmoides</i> )	0	0	5	5	1.0	100	7.1
White crappie ( <i>Pomoxis annularis</i> )	0	0	4	4	0.8	12	0.8
Black crappie ( <i>P. nigromaculatus</i> )	0	0	1	1	0.2	17	1.2
Total	39	100	340	479	99.7	1,404	99.7



do attract large numbers of egrets in some years—as many as 500 having been seen at Willow Slough (Nolan 1952).

The ratio of our spring (March–May) to fall (July–October) counts of great egrets was 1.0 to 12.9 for the entire state, including the data for central Illinois, which had an exceptionally low spring count in 1969 (Fig. 29). The ratio for northern Illinois was 1.0 in spring to 11.2 in fall, and for southern Illinois, 1.0 to 8.1. As the best age ratio we observed was 1.0 adult to 1.25 young at fledging age, the high fall ratio strongly reflects the summer influx.

## Food

The food items taken by great egrets appear to be very similar to those used by great blue herons but with a much higher proportion of gizzard shad in the egret's diet (Tables 4 and 10). Also important as egret food were carp, emerald shiner, bigmouth buffalo, and bass. Galbreath's (1961) list of prey species seen at East St. Louis (a colony we did not visit) is very similar to ours for six other colonies on the Mississippi and Illinois rivers (Table 10).

From the lists of prey species, one might suspect that the great blue heron and great egret are strongly in competition for food for their respective young, but the two species appear to be catching different age-classes of fish. The egrets start nesting about 3 weeks later than do the great blues, and though the egret's nesting cycle is about 10 days shorter, the egret's young are generally well behind the young of great blue herons in size. Food size increases as the young herons grow (Lopinot 1950), and we found food items from egrets to be consistently smaller than those from great blues in the same colony on the same date. For example, specimens of gizzard shad—the most important food species for both herons and egrets—varied from 25 to 305 mm in length (mean: 142 mm) from great blue heron young, and from 38 to 178 mm (mean: 61 mm) from egret young. The measurements indicate that egrets are feeding mainly on shad young of the year, when great blues are taking yearling shad (see Miller 1960 for growth data on fish).

Data on the food of adult egrets are lacking. Franzen (1934) observed that egrets stayed later in the evening (by 1½ hours) than great blues to forage before going to roost. Though egrets characteristically fish from a standing position, Hodges (1947) saw one hover briefly in flight and drop into the water to pick up food.

## Winter Records

Musselman (*in* Mumford 1961a) referred to great egrets wintering near Quincy, but we have seen no other record showing that egrets spend the winter in Illinois. Though there are a few late December (27,

28) records as far north as the Princeton area, presumably on the Illinois River (Dyke 1953, Kramer 1957 and 1962), and a 30 December record for Cape Girardeau (Anonymous 1949), we have found no January record for the great egret in Illinois. The species is apparently much less cold tolerant than is the great blue heron.

## SNOWY EGRET (*Egretta thula*)

(Fig. 31 and 32)

### Spring Migration

To some extent the observed timing of events in a population is a function of the size of the population (as is the number of observations)—larger populations showing great latitude in all measurable characters, including the timing of migration. The snowy egret population in Illinois is relatively small. The earliest report for the area known to us is 2 April in adjacent Indiana (Keller 1966), but the snowy is not usually sighted in Illinois before mid- or late April (Fig. 33, Cooke 1888, Anderson 1964a, Petersen 1968a). There is little obvious variation in its arrival in different regions of the state, and the appearance of a few snowies in the north, where they

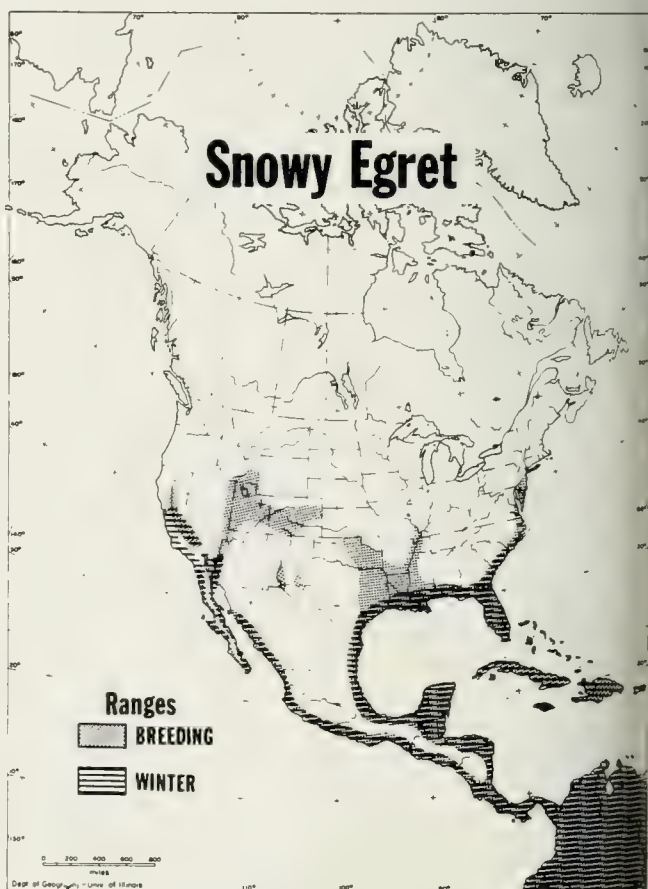


Fig. 31.—General distribution of the snowy egret.



Fig. 32.—Adult snowy egret attending its nestlings at Comment Sanctuary. The snowv is a small (about 50 cm tall) white heron with black bill and legs and yellow feet (barely visible at bottom of picture). Note abundant aigrette plumes on the back. Photograph by Robert Starr.

are not known to breed, suggests the possibility that the birds are overflying northward during night migration. The peak in late April (Fig. 33) and the relatively small number of records in May are also suggestive of this possibility though Anderson (1964a)

noted that snowies were seen commonly after 25 April in the Mississippi bottoms south of St. Louis, where they probably do nest. Highly plumed birds have been reported on 27 May and later (Comfort 1957, Anderson 1962a and 1964c).

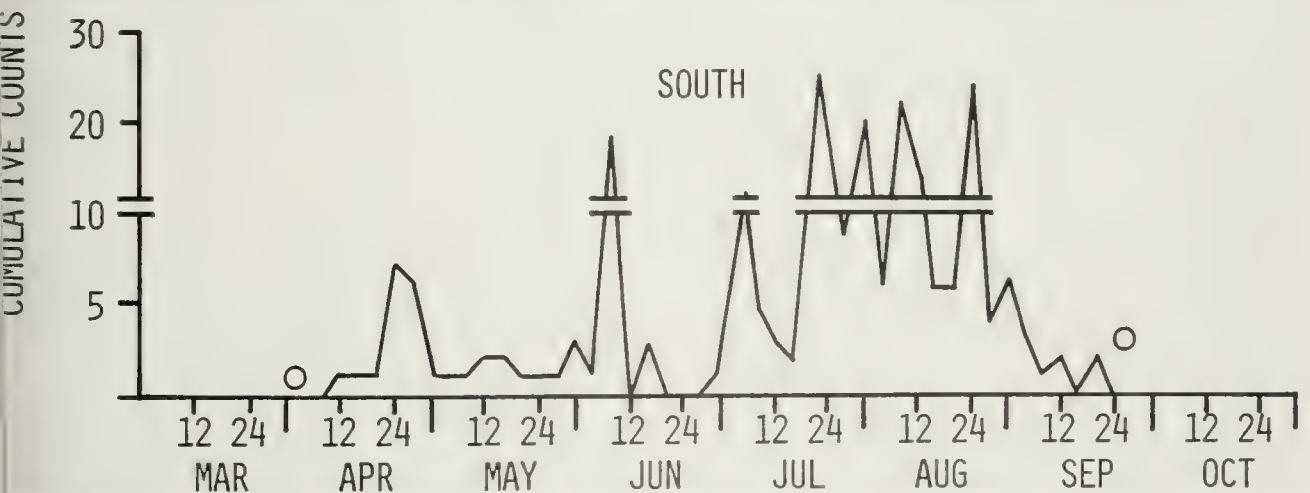


Fig. 33.—Cumulative counts by all observers of snowy egrets in southern Illinois. Circles represent the earliest and latest records for the state.



## Distribution

The snowy egret nests primarily in the southern United States and Central and South America (Fig. 31). In Illinois the only known recent nestings are in or near the Mississippi Valley (Fig. 34) north as far as Pike County (William H. Elder unpublished). Butler's (1897) reference (from Ridgway) to breeding records for the snowy egret in adjacent Knox and Gibson counties, Indiana, cannot be substantiated, nor can Kennicott's (1853-1854) record for Cook County, Illinois. Bent's (1926) reference to snowy egrets breeding north of Peoria is also enigmatic, since no nests of the species have been discovered in the Illinois valley.

The unquestioned nest records are all recent, mainly from the East St. Louis area (Fig. 34, Petersen 1970, Kleen 1975b). It is unclear from Fleig's (1971) report whether he actually found nests in the Fults area. Neither Hurter (1884) nor Widmann (1907) knew of nest records for the snowy egret in the St. Louis area. In fact, there were apparently no records of any kind for snowies in the area until 1934 when Jones (1935) reported them as plentiful (see

also Short 1942). Nonbreeding snowy egrets appear widely in the state, especially in late summer and fall (Fig. 34), but, proportionate to the number of observers, at all seasons there are many more records of this species in the southern region of the state than there are in the central and northern regions.

## Nesting Habitats and Populations

There are virtually no data on the nesting or foraging habitats of snowy egrets in Illinois. Snowy egret nests in Illinois have always been associated with those of other species of colonial herons, especially little blues, in lowland thickets or forest. In Alexander County, Michael Morrison (unpublished) observed snowies foraging in very shallow (5 cm) water.

The largest number of snowies recorded nesting in one place (East St. Louis) in the state was four pairs (Petersen 1970). The number of snowy egrets in the Comment Sanctuary is small and variable, and apparently, the species is absent there in more years than it is present (Wrischnik 1973 and 1975-1976, Kleen 1974-1975 and 1976-1977). There are no absolute population measurements for the snowy egret in any area of Illinois, but the total breeding population is probably less than 50 birds in a high year. An undated reference to "thousands" of snowies on the Illinois River (H.F.A. 1889) is almost certainly a case of misidentification. The highest 1-day count of snowies in June (6 June 1977) was 18 in Alexander County (Michael Morrison unpublished), and more often only 1-3 per day are reported.

The destructive work of the plume hunters in the 19th and early 20th centuries greatly reduced the entire U.S. population of snowy egrets (Cooke 1913), and the species apparently disappeared completely from Illinois and vicinity (Widmann 1907). There were very few Illinois records between 1890 and 1930, but the population gained greatly in the 1930's and 1940's (Jones 1935, Cunningham 1947). There is no evidence, however, that there was ever a large breeding population (i.e., more than a few pairs) in Illinois.

Nothing has been recorded on the nesting cycle in Illinois.

## Fall Migration

Snowy egrets, like great egrets and several other herons, appear to move northward after the nesting season, and the fall population is much greater than the spring population in Illinois (Fig. 33), reflecting the influx of birds from more southern breeding grounds. Banding records are not available to show the precise sources of snowies that come to Illinois. The influx probably begins in July, and the number of birds remains relatively high through most of August (Fig. 33), depending probably on the availability of suitable foraging areas. In late August and

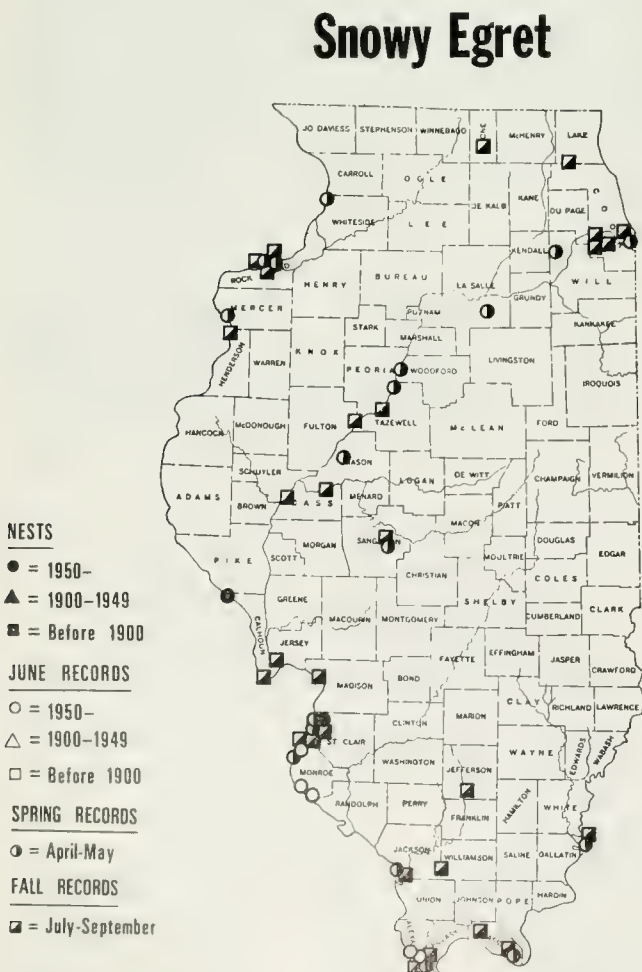


Fig. 34.—Distribution of records of snowy egrets in Illinois.

early September, snowies definitely begin to leave the state, and few are seen after 12 September (Fig. 33). The latest record known to us is 27 September (Bellrose 1941). The late summer numbers vary greatly from year to year, with concentrations as high as 20–30 birds having been reported in some years (Dumont 1932, Nolan 1952) though such numbers are exceptional for the species in Illinois. Jones (1935) suggested that an apparent abundance of snowy egrets might be related to extensive drought that concentrated the birds where water remained.

## LOUISIANA HERON

(*Hydranassa tricolor*)

There was only one report of the Louisiana heron for Illinois before 1968. One was seen at Jackson Park, Chicago, on 22–23 May 1939 (Levy 1940, Ford 1956). In 1968 an adult was observed between 2 June and 6 July near Fults, Monroe County, on the Illinois levees of the Mississippi River (Petersen 1968b, Hamilton 1969). In 1969 a Louisiana heron was seen in Illinois across the Mississippi River from Cape Girardeau on 28 June (Anderson 1971a). In 1974 one was photographed at Ware, Union County, on 23 April, and one was seen in Illinois near St. Louis on 23 May (Anderson 1974a, Kleen 1974e). In 1976 Louisiana herons were reported at East St. Louis from 24 April to 30 April, at Waukegan from 27 June to 4 July, and at Springfield Lake, Sangamon County, on 4 and 5 October (Kleen 1976d and 1977a). One was seen at Waukegan on 18 April 1977 (Kleen 1977b). The increased incidence of sightings of Louisiana herons may be the result of some ecological change, but it may also result, in part, from more trained observers being in the field.

## BLACK-CROWNED NIGHT HERON

(*Nycticorax nycticorax*)

(Fig. 35 and 36)

### Spring Migration

A few black-crowned night herons sometimes winter in Illinois, but the first signs of the spring migration are not usually seen before 20 March or, more often, early April (Fig. 37). McCarty (1928) reported that these birds arrived at a Tuscola colony quietly during the night, between 8 and 15 April in various years. In the Mississippi Valley near St. Louis night herons arrived at one colony by 19 March (Jones 1939a) and at another by 31 March and 4 April in different years (Comfort 1958a, Anderson 1963b). In the north (Plainfield) Gossman saw 6 black-crowns on 31 March and 146 on 12 April (Fawks 1966b). The migration is presumed to be nocturnal. We have heard migrant night herons flying at night over east-central Illinois between 28

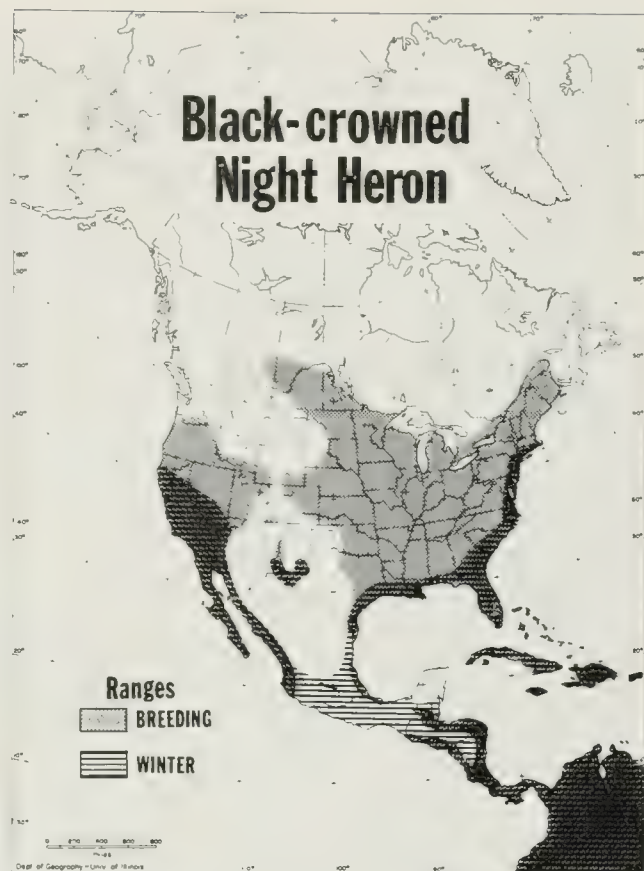


Fig. 35.—General distribution of the black-crowned night heron.

March and 30 May, with maximum calling heard between 12 April and 24 May. The calls were heard at all hours of the night (7:00 pm–5:00 am) with no particular mode.

### Distribution

The black-crowned night heron has a nearly worldwide distribution, including much of North and South America (Fig. 35). In Illinois the distribution is poorly known, partly because of the species' rather secretive nature. The absence of breeding records from much of the south (Fig. 38) is puzzling but may merely reflect the shortage of observers in the region. Ridgway (1895) and Nelson (1876 and 1877), who knew the birds of southeastern Illinois, were peculiarly mum about the black-crowned night heron in southern Illinois, as was Barnes (1912) in Marshall County, and Musselman in Adams County. Gross (1923) referred to small nesting colonies on the Wabash drainage, but did not give specific localities. Because night herons nest singly as well as in colonies, their nests can be easily overlooked. Even small colonies can be well concealed. Harold M. Holland (unpublished notes) referred to an old colony in Stark County (location ?). The black-crowned night heron is known from Indian middens only from the Peoria



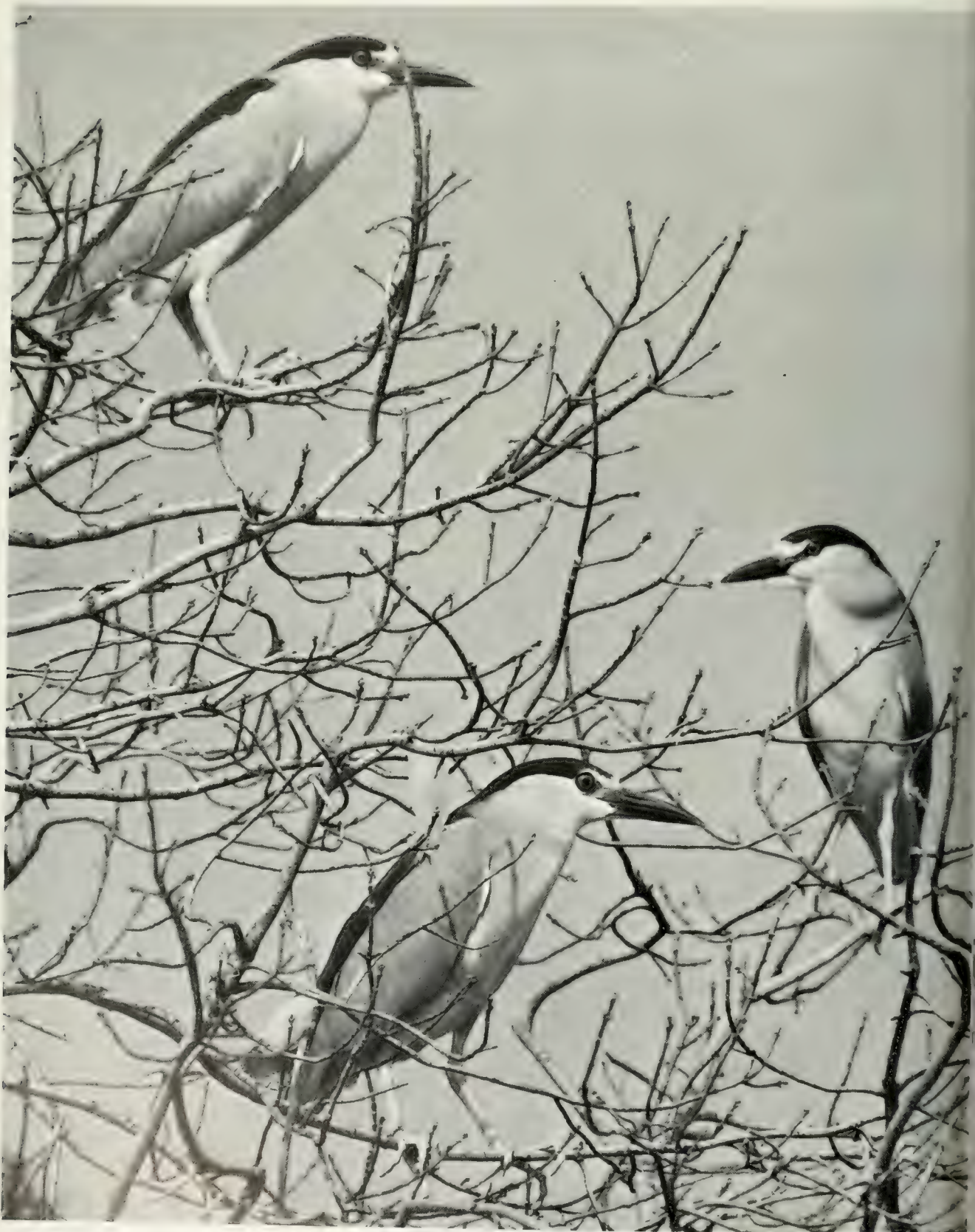


Fig. 36.—Adult black-crowned night herons. They are rather short, squat (about 50 cm tall) herons with black backs and white underparts.

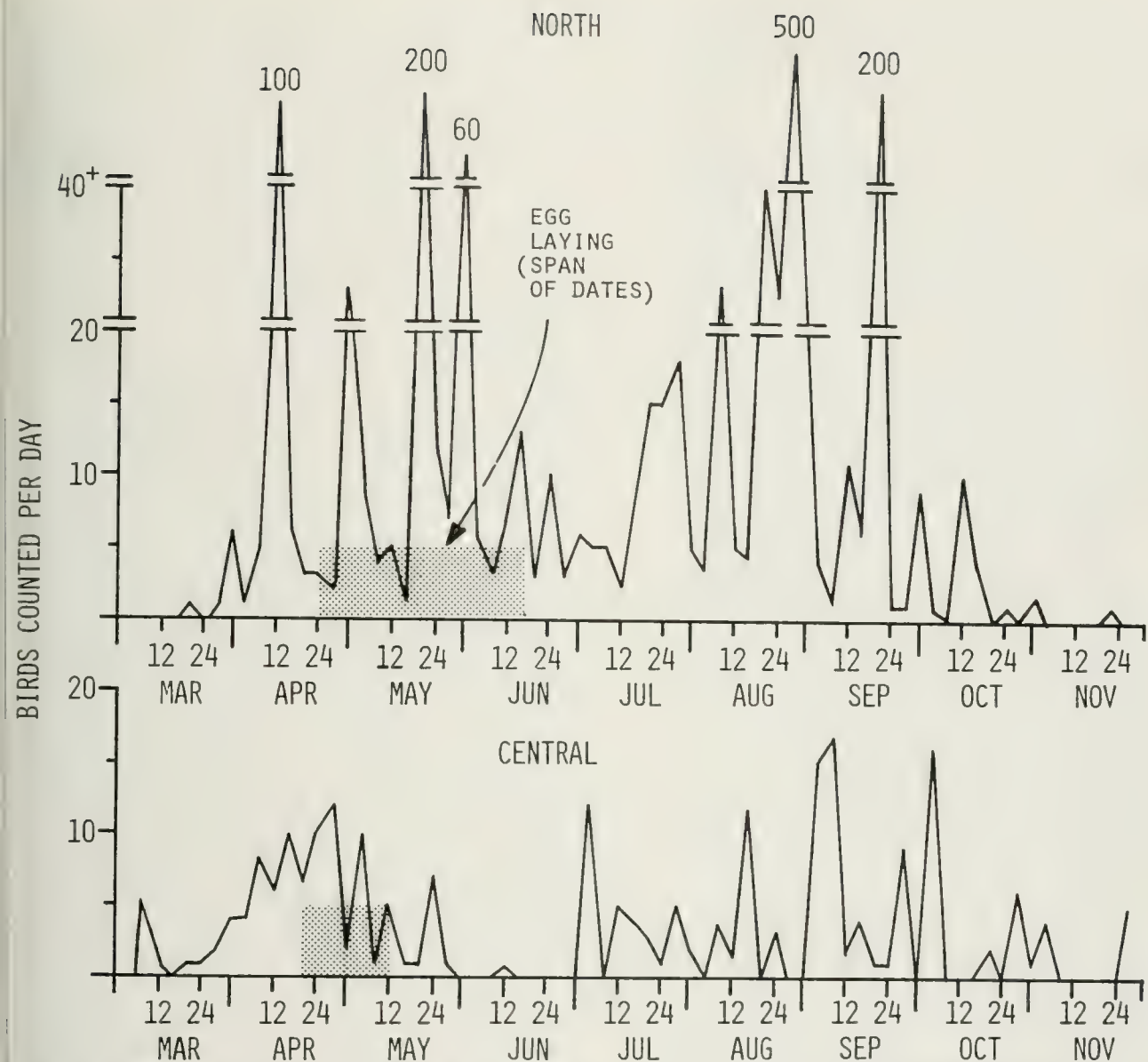


Fig. 37.—Egg-laying and migration seasons of the black-crowned night heron, as indicated by the highest daily counts of each day by all observers in north and central Illinois. Too few counts exist for southern Illinois to graph them. Shaded areas show the span of dates during which egg laying has been recorded.

area, dating back to about 1100 AD (Baker 1936 and 1941, Parmalee 1962a).

### Nesting Habitats and Populations

Black-crowned night heron nesting colonies have been found in a variety of arboreal habitats, from upland orchards (Gross 1923) to extensive bottom-land forests and even towns and cities (Cunningham 1945, Farwell 1919). A very different nesting habitat is treeless open marshland, where black-crowns nest in herbaceous vegetation just inches above the water (Nelson 1876–1877, Murchison 1892). Nesting black-crowned night herons are sometimes associated with great blue heron–great egret colonies (or vice

versa) in which situations the night herons' nests are always under the canopy and lower than the nests of the larger herons. Murchison (1893a) observed colonies especially in second-growth timber. The predominant species of nest tree for night herons at Pekin was green ash (Bjorklund 1975). Nests at Addison were also in ash trees and oaks (Eifrig 1913). Willows—presumably black willows (Jones 1937a, Cunningham 1941)—and silver maples are commonly used nest trees for black-crowns in the Mississippi Valley, but at East St. Louis, Galbreath (1961) noted the nest trees to be elms, hackberries, and pin oaks. Other tree species in which we have seen black-crown nests are catalpa and box elder. Frank Bellrose (un-



# Black-Crowned Night Heron



Fig. 38.—Distribution of nesting colonies and other breeding records of black-crowned night herons in Illinois.

published) found a colony near Delavan in a plantation of European larch (*Larix decidua*). Tree nests have been found as low as 1 m high, but generally they are 8–14 m high (Murchison 1893a, Eifrig 1919, Hammerslough & Bjorklund 1968). The open marsh nests were said to have been placed in wild rice (Nelson 1876–1877), but Kumlien & Hollister (1951) stated that the plant was actually *Phragmites*. Marsh colonies have not been reported in this century.

The nesting sites of this heron are so varied as to suggest that the nature of the nesting site *per se* is relatively unimportant compared with the nature of foraging areas. In its distribution the black-crown seems to be associated with marshland (Lobik 1952, Finley 1913), but its precise foraging ecology is unknown, probably in part because of its nocturnal activity pattern. McCarty (1928) reported that black-crowns tended to remain quiet between 8:00 am and 5:00 pm, but foraged along a small creek or the Embarras River when the creek dried up. Gross (1923) felt that the size of the Atwood colony was controlled by the available food supply. The colony, with a maximum of 12 nests, was about 10 miles from the

contemporaneous Tuscola colony, and Gross believed that in dry years the birds were taxed to find enough food for their young and themselves. Coursen (1947) found the local colony at Orland to be highly variable from year to year, which complicates the interpretation of population trends. Black-crowns have in some cases exhibited strong tenacity to colony sites. The Chatsworth colony was believed to have been occupied for 50 years (Anonymous 1946), Tuscola for possibly 40 years (McCarty 1928), and Depue for at least 40 years. Hess (1910) noted that colonies in the Philo area appeared to fragment and scatter before they disappeared completely.

Night heron colonies are not visible from the air, and it is much more difficult to obtain an estimate of the state population than it is to obtain one for great blues or great egrets. As with other species of herons, no data exist on population densities of foraging night herons. On cross-country censuses in 1907–1909, Alfred Gross and Howard Ray encountered 15 black-crowns (at least 5 adults) in about 338 km of transects (about 1 per 22 km) in all habitats in northern and central Illinois. In 1957–1958 we encountered just 2 black-crowns in about 475 km of transects (1 per 237 km) in all habitats of those regions. Though the transects represent all habitats, the herons were seen mainly in small acreages of marsh, with pasture the second most common habitat. Pasture often contains marshy areas. The transects were all made in daytime and are not well designed to census foraging night herons, but the data do suggest a serious decline in the black-crowned night heron population in the past half century. Even earlier Widmann (1907) stated that the population had been greatly reduced. Other evidence of the decline is the disappearance of numerous colonies without apparent replacement (Fig. 38, Table 11). In fact, we personally know of only four extant Illinois colonies of any size—Waukegan, Plainfield, Clear Lake, and East St. Louis—all associated with areas that still have marshes nearby. Because black-crowned night heron colonies are easily concealed in small groves or marshes, we suspect that there are a number of other colonies still extant. It is important to locate the existing colonies and provide protection for both the nesting sites and the foraging areas. The extent and causes of the nesting population decline of this species are unknown, but the encroachment of humans on all habitats must certainly be a factor.

## Nesting Cycle

Black-crowned night herons apparently go directly to the nesting colonies as they return from the winter range (see under spring migration above). At Tuscola, McCarty (1928) reported that the birds were relatively inactive during the first 3–4 days after arrival. Courtship and mating behavior in Illinois

TABLE 11.—Black-crowned night heron colonies in Illinois and adjacent areas.

Colony Site	County	Year	Number of Nests	Reference
Mississippi River Drainage				
Sabula, Iowa	Jackson	1943	2	Harlan (1943)
Sabula, Iowa	Jackson	1974	0	This paper
Andalusia	Rock Island	1948	P <sup>a</sup>	Hodges (1950)
Andalusia	Rock Island	1949	148	Hodges (1950)
Andalusia	Rock Island	1950	P	Hodges (1951)
Andalusia	Rock Island	1965	50 (+) <sup>b</sup>	Brown (1965), Petersen & Ward (1966)
Andalusia	Rock Island	1966	50	Petersen & Ward (1966)
Andalusia	Rock Island	1969?	P	Brown (1969)
New Boston	Mercer	1962	0	Brown (1962)
New Boston	Mercer	1965	P	Greer (1966)
New Boston	Mercer	1973–1977	0	
Atlas	Pike	1948	25	Musselman (unpublished)
Clarksville, Mo. (north)	Pike	1941	P	Jenkins (1942)
Clarksville, Mo. (north)	Pike	1942	60	Cunningham & Spotswood (1942)
Clarksville, Mo. (north)	Pike	1958–1959	P	W. H. Elder (unpublished)
Hamburg	Calhoun	1973	1	This paper
Hamburg	Calhoun	1974	0	This paper
Gardenne Lake, Mo.	St. Charles	1936	P	Jones (1936b)
Gardenne Lake, Mo.	St. Charles	1937	P	Jones (1937c)
Gardenne Lake, Mo.	St. Charles	1938	P	Jones (1940b)
Emps Clair Marsh, Mo.	St. Charles	1937	400	Jones (1937a)
Emps Clair Marsh, Mo.	St. Charles	1938	100 (–)	Jones (1938a)
Elton	?	1941	75	Cunningham (1941)
St. Louis, Mo.	St. Louis	1945	P	Cunningham (1945)
Grand Marais (East St. Louis)	St. Clair	1955	P	Comfort (1955b)
Grand Marais (East St. Louis)	St. Clair	1958–1959	P	Comfort (1958a, 1959)
Grand Marais (East St. Louis)	St. Clair	1961	250	Galbreath (1961)
Grand Marais (East St. Louis)	St. Clair	1962	100	Anderson (1962b)
Grand Marais (East St. Louis)	St. Clair	1963	150	Anderson (1963b)
Grand Marais (East St. Louis)	St. Clair	1964	P	Anderson (1964a)
St. Louis (Comment Sanctuary)	St. Clair	1964–1976	P	Wrischnik (1973, 1975–1976), Kleen (1974–1975, 1976–1977)
Watts Marsh	Monroe	1964?	"many"	Anderson (1964c)
Watts Island	Monroe	1971?	P	Fleig (1971)
Watts	Monroe	1974	95	This paper
Watts	Monroe	1975	15	This paper
Watts	Monroe	1976	0	This paper
Commerce, Mo.	Scott	1975	200	This paper
Illinois River				
Starved Rock	La Salle	1944	P	Ries & Werner (1946)
Peepue	Bureau	1937	8	Bartel (1937)
Peepue	Bureau	1973	51	This paper
Pennepin	Putnam	Prior to 1907	P	Bellrose (1939b)
Big Lake (Duck Island)	Fulton	1938	P	Bellrose (1939b)
Beekin	Tazewell	1962–1972	6–355	See Bjorklund (1975) for complete record
Beekin	Tazewell	1973	0	Bjorklund (1975)
Clear Lake	Mason-Tazewell	1973	109	Bjorklund (unpublished)
Clear Lake	Mason-Tazewell	1977	140	Bjorklund (unpublished)
Maples	Scott	1974	10 (+)	J. Funk (unpublished)
Areas Other Than Mississippi and Illinois Rivers				
Rockford (northwest)	Winnebago	1921?	P	Riis (1921)
Winnebago	Winnebago	1938–1940	P	Bartel (1942)
Winnebago	Winnebago	1955	0	Anonymous (1955)
Rockford area	Winnebago	1947	P	DuMont (1947b)
Rockford area	Winnebago	1961	P	Johnson (1961)
Franklin Grove	Lee	1925	P	Blocher (1926)
Embo	Lee	1933–1934	P	Blocher (1937)
Annawan area?	Henry	1892?	Many	Murchison (1892)
Antioch (north in adjacent Wisconsin)	Kenosha	1954–1956	P	Williams (1957)
McHenry (west)	McHenry	1931–1932	P	Anonymous (1933)
McHenry (west)	McHenry	1934	P	Sanborn (1934b)

(Table 11 continued on next page.)



TABLE 11.—Continued

Colony Site	County	Year	Number of Nests	Reference
Grass Lake	Lake	1876	50	Nelson (1876–1877)
Beach	Lake	Before 1914	P	Sanborn & Goelitz (1915)
Lake County (location?)	Lake	1921	250	Ford et al. (1934)
Waukegan	Lake	1975	1	Kleen (1975–1976)
Waukegan	Lake	1976	26	Kleen (1976c)
Lake Forest	Lake	1941	2	Smith (1941)
Skokie	Cook	1940?	"large colony"	Langdon (1940)
Skokie	Cook	1947	125	DuMont (1947b)
Palos Hills (Sag)	Cook	1913?	Many	Finley (1913)
Orland	Cook	1921	250	Sanborn (1921)
Orland	Cook	1932	P	Strong (1932)
Orland	Cook	1921	200	Coursen (1947)
Orland	Cook	1945	60	Coursen (1947)
Lake Calumet	Cook	1951–1952	P	Bartel (1952), Lobik (1952)
Lake Calumet	Cook	1961	100	P. Norton (unpublished)
Lake Calumet	Cook	1975	0	Kleen (1975a)
Blue Island	Cook	Before 1959	400?	Mumford (1959)
Blue Island	Cook	1959	0	Mumford (1959)
Elmhurst (Addison?)	Du Page	1895	P	Farwell (1919)
Addison (Two sites)	Du Page	1911–1919?	P	Eifrig (1911, 1913, 1915b, 1919)
Glen Ellyn	Du Page	1891	P	Gault (unpublished)
Geneva	Kane	1927	P	Gault (unpublished)
Plainfield area	Will	1942	P	Bartel (1942)
Plainfield area	Will	1949	800	Ford (1956)
Plainfield area (Lake Renwick)	Will	1971	150	This paper
Plainfield area (Lake Renwick)	Will	1973	146	This paper
Plainfield area (Lake Renwick)	Will	1977	41	J. W. Olson (unpublished)
St. John, Ind.	Lake	1950–1956?	P	Ford (1956)
Willow Slough, Ind.	Newton	1953	P	Ginn (1954)
Willow Slough, Ind.	Newton	1959	0	Mumford (unpublished)
Chatsworth	Livingston	1946?	P	Anonymous (1946)
Chenoa	McLean	1958–1959	P	S. Schenck (unpublished)
Gridley (south)	McLean	1964	P	D. Birkenholz (unpublished)
Delavan (north)	Tazewell	About 1938	P	Bellrose (unpublished)
Berlin	Sangamon	1941	1	Robertson (1941a)
Lake Springfield	Sangamon	1949?	P	Eifert (1949)
Lake Decatur	Macon	1959	5	C. T. Nearing (unpublished), Thompson (1960)
Decatur (northeast)	Macon	1952–1958	20	F. Irwin (unpublished), R. Sandburg (unpublished)
Arthur	Moultrie	1972–1975	7	F. Irwin (unpublished), C. T. Nearing (unpublished)
Cadwell	Moultrie	1966	11	This paper
Atwood	Douglas	1899–1909	12	Gross (1923)
Tuscola	Douglas	About 1890–1928	(max.) P	McCarty (1928)
Tuscola	Douglas	1935	P	Black (1935)
Rantoul (north)	Champaign	Before 1967	P	J. and R. Meece (unpublished)
Philo (SW, Embarras River)	Champaign	1901	38	Hess (1902, 1910)
Philo (SW, Embarras River)	Champaign	1902	38 (+)	Hess (1902, 1910)
Philo (SW, Embarras River)	Champaign	1901–1909	P	Black (1935)
Salt Fork (location?)	Champaign	1909	P	Hess (1910), Black (1935)
Sidney	Champaign	1910	P	Black (1935)
Urbana (east)	Champaign	1949	1	Miller (1955)
Sidell	Vermilion	1911?	P	Anonymous (1911)
Fithian	Vermilion	1936	P	Bellrose (unpublished)

<sup>a</sup> Nests present but not counted.

<sup>b</sup> The plus or minus sign indicates an approximate number larger (+) or smaller (–) than that shown.

have not been described, nor have the vocalizations. The call most often heard is the loud, abrupt note, "quok," often heard singly; however, sometimes several notes run together in a string.

The age composition is unknown for any Illinois population. Gross (1923) saw some yearling birds nesting in a colony in Massachusetts. Whether first-year birds, in general, breed is not known.

Night herons reuse old nests, which are refurnished with fresh material (McCarty 1928, Gross 1923), and both members of the pair participate in the building. Tree nests have not been described in Illinois. Marsh nests were generally built of green rushes and stalks of marsh grass, but sometimes of ticks carried some distance (Murchison 1892 and 1893a). The marsh vegetation, which grew in water 1–91 cm deep, was formed into a platform 5–15 cm in depth, often so flat that eggs rolled off. The nests had a pentagonal or hexagonal shape, 30–38 cm in diameter (Nelson 1876–1877). In New England tree nests usually were built in 2–5 days (Gross 1923). Some of the nests are frail and flat, and Gross saw both eggs and young dumped out by the wind.

The eggs, which are greenish-blue or pale blue when fresh, are laid on alternate days, and incubation begins with the first egg (Palmer 1962, Gross 1923). From hatching and fledging dates, we have estimated the laying season to extend from at least 1 April to 18 June in central and northern Illinois (Fig. 37). There are very few data for central Illinois, and none for the south, on any phase of the life cycle. Most of the egg sets (usually fresh) that we have seen in museums were taken in May, and Harshbarger (1936) refers to a fresh set of five eggs taken on 2 May in Cook County. Eifrig (1915b) found night herons still building nests and with no eggs laid on 1 May at Addison. The pairs of a colony may not necessarily be synchronized in laying. Murchison (1893a) found eggs nearly ready to hatch in some nests on 27 May in a Winnebago County colony, where some birds were still building nests. In Lake County, Nelson (1876–1877) found both fresh eggs and young as old as 10 days on a day in June. These differences may have stemmed from an earlier loss of some of the nests in the colonies, as we have noticed that most nestlings in a colony tend to be of similar age (Fig. 41), indicating synchronization of laying. Some variation in the ages of nestlings is to be expected because incubation begins with the first egg.

Murchison (1893a) found considerable variation in clutch size among colonies of black-crowns. In Lake County he saw clutches with 3–5 eggs, averaging 4, but in Winnebago County sets were usually 4–5 eggs with some of 6. At a marsh colony in Henry County, following an egg-stealing raid by the local Indian populace, Murchison (1892) saw that most sets had 3 eggs and none more than 4. Fifteen clutches of black-crown eggs in the Field Museum,

taken 1893–1900, were mainly of 4 eggs (eight sets), with three sets of 3 eggs, and two of 5 eggs. There were two sets of 7 eggs, an uncommonly large clutch in Illinois. There are no recent data on clutch size. Hatching rates are unknown.

Gross (1923) found the incubation period to be 24–26 days, and he shows the development of young to 44 days of age, when they are essentially full grown. Palmer (1962) noted the age of first flight for black-crowns to be 6 weeks. At East St. Louis young still in the nest have been seen as late as 13 September (Fawks 1970a), but this must be exceptionally late. More typically we would expect all of these birds to be fledged before the end of August. There is a great need for data on nesting success and productivity. The only Illinois information on the subject is the observation by Neal (*in* Kleen 1976c) that 26 nests at Waukegan produced 86 young (3.3 young per nest). The causes of nest failures are unknown.

### Fall Migration

As do other Illinois herons, black-crowns move northward after the nesting season. What percentage of the population moves north is unknown, but apparently many do. About one-third of the recoveries of black-crowns (of all ages) banded in Illinois were retrieved in Wisconsin, i.e., north of the colonies banded (Bartel 1976). These northward flights begin in August very soon after the nesting activities finish. Illinois birds have been recovered in Wisconsin as early as 21 August and as late as 1 November (Bar-



Fig. 39.—Distribution of recoveries (solid dots) of black-crowned night herons (1) banded in Saskatchewan as nestlings and recovered in Illinois, and (2) banded in Illinois as nestlings. Circles show locations of banding stations.



tel 1976). How soon the southward flights begin is not known. Night herons banded in Canada have been recovered in Illinois in October (Houston 1967, Fig. 39), and an Illinois-banded young night heron was recovered in British Honduras in October (Bartel 1976). There is no way to tell when these southward flights were initiated.

We have heard night herons calling over east-central Illinois farmland, at sites with no local colony, on about one-third of the nights between 21 August and 28 October. The calls were heard during

all hours of the night, especially between 8:00 and 11:00 pm CST. There was much more calling in September and early October than in August or after 10 October, and we suspect that the September and early October calls were those of migrating birds.

The counts of night herons (Fig. 37) fall off sharply in late September and early October, a change that probably represents a general exodus of birds from the north, i.e., both local birds and those from north of Illinois. Though most of the population is south of Illinois by the end of October, there are



Fig. 40.—Young black-crowned night herons in their nest. The streaked appearance is retained for several months and closely resembles that of the young yellow-crowned night heron (not shown).





Fig. 41.—Part of the nesting colony near Plainfield, showing both adult and juvenile black-crowns at several nests.



enough November and December records even in northern Illinois to suggest that a few black-crowns tend to linger, perhaps regularly (Eifrig 1917, Boulton & Pitelka 1939, Boulton & Beecher 1940, Fawks 1966a and 1970a).

Unfortunately, no observers have kept track of age ratios of night herons on any systematic basis, but such data may be useful as a measure of productivity. The distinctive immature plumage (Fig. 40 and 41) is retained for more than a year and is an easily recognizable age indicator (Gross 1923). The counts of black-crowns (from all sources) in northern Illinois show a ratio of 1.0 bird seen in spring (March–May) to 2.9 in late summer and early fall (August–October). The central Illinois counts are too fragmentary to consider.

### Winter Records

The cold-hardiness of black-crowned night herons is attested to by the fact that some have apparently survived northern Illinois winters (Blake 1948b, Nolan 1953a, Kleen & Bush 1971a and 1972b). Shirley Schenck (unpublished) observed black-crowns at

their colony site in Chenoa in January 1960, and there are numerous scattered winter records (Fig. 42). However, the survival rate for the species in winter in Illinois is not known. Ridgway (1881) considered the black-crown to be a winter sojourner in southern Illinois, but there are very few specific records for the south. Link (1940) and Jones (1940a) reported on a specimen that did not survive the winter at Pere Marquette Park. The general absence of February records of black-crowns in any part of the state may imply poor winter survival or just a paucity of observers at that season. Birds that wintered in the Beach area in 1921 (Eifrig 1921) and the Chicago area in 1971 and 1972 (Kleen & Bush 1972b) were identified as immatures, as was a February specimen in the Rock Island area (Mumford 1960b), but most of the winter birds have not been aged. The majority of winter records of black-crowns are recent (Fig. 42), possibly reflecting only the increased interest in birds in recent years. The absence of records generally from southern and western Illinois is perhaps related to the scarcity of observers in those areas.

### Food

Food specimens regurgitated by young black-crowned night herons at three Illinois colonies—Plainfield, Depue, and Fults—showed much the same dominant prey species as those used by great blues and great egrets in the state. Of 128 identifiable items recovered, 102 (79.7 percent) were gizzard shad, 16 (12.5 percent) were carp, and 7 (5.5 percent) were sunfish (mainly green, one orangespotted), plus 1 (0.8 percent) longnose gar, 1 black crappie, and 1 crayfish. Food items ranged from 2 to 18 cm in length. Carp were larger, on average (12 cm), than the shad (7 cm) or sunfish (8 cm). McCarty (1928) also recorded the food at Tuscola as small fish and crayfish, but at Atwood the chief foods were frogs and crayfish (Gross 1923). In Cook County, Sanborn (1934b) found black-crowns feeding on painted turtles.

The foraging techniques of black-crowns have not been described. They apparently are capable swimmers. Pitelka (1937) observed two adults floating in open deep water in the fashion of gulls, with wing tips and tail held above the water, but there is no evidence that the birds were foraging in this way.

### Longevity and Mortality

Bartel (1976) banded 1,144 nestling black-crowned night herons at colonies—Winnebago, Plainfield, and Lake Calumet—in northern Illinois between 1937 and 1952. He obtained recovery data on 25 (Bartel 1958 and 1976). An additional recovery was published by Cooke (1938). We considered all recoveries to represent losses to the population, and plotted the losses against age (Fig. 43). The oldest bird (recovered at

## Black-Crowned Night Heron



Fig. 42.—Distribution of winter (15 December–1 February) records of black-crowned night herons in Illinois.

skeleton) probably had survived for over 14 years, and the average age of all birds recovered was about 10 years and 11 months. Young birds had poor survival, with about 61 percent lost in the first year. As with the great blue, a high percentage (42) of the birds were shot (admittedly so) and the other birds designated "found dead" may also have been shot. Most of the birds were killed in late summer and fall, the highest percentage (16) in November (Fig. 43), a month when many hunters are active, and much of the mortality must be attributed to (illegal) hunter vandals. After the less wary birds are eliminated, survival improves. In a much larger sample of recoveries representing North America, Hickey (1952) found that 52 percent of the young black-crowned night herons were lost in the first 4 months. Adult (birds over 1 year) mortality, calculated by the method of Lack (1949), was about 27 percent per year (excluding the four oldest birds) for the small Illinois sample and about 30 percent per year based on the North American recoveries (Hickey 1952).

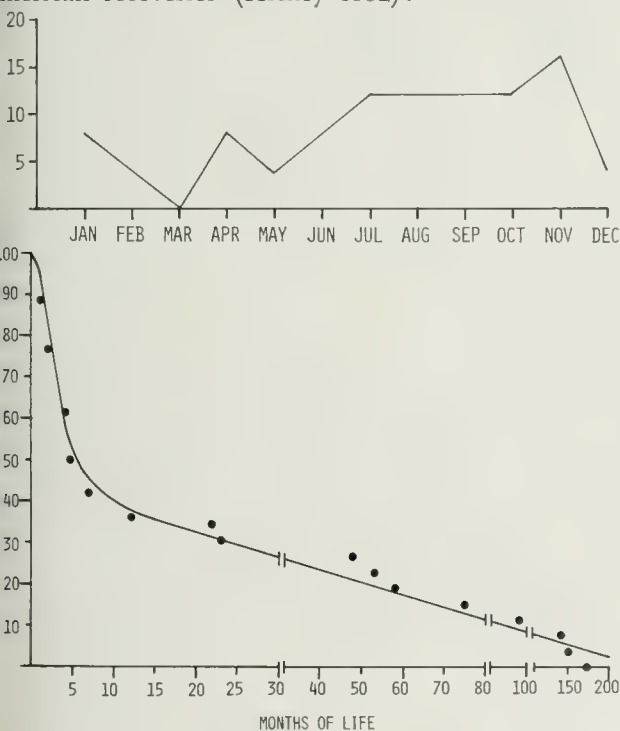


Fig. 43.—(Top) Distribution, by month, of banded black-crowned night herons killed, many by hunter vandals. (Bottom) Survival (or mortality rate) of black-crowned night herons banded as nestlings in northern Illinois. A dot may represent more than one bird.

## YELLOW-CROWNED NIGHT HERON (*Nyctanassa violacea*)

(Fig. 44 and 45)

### Spring Migration

Yellow-crowned night herons are not usually detected in Illinois until April, but there is at least one

March (29th) record for southern Illinois (R. D. Palmer unpublished, Kleen 1975c). There are early April records for southern Illinois (George 1968) and even for the north (DuMont 1947a, Fawks 1967a). However, yellow-crowns are more often first detected in the state in mid- or late April, and peak numbers are seen in May and early June (Fig. 46). The migration has never been observed, and the counts may relate more to the timing of human activity than to that of the birds. Our peak counts of foraging birds seen per day were 10 and 14 birds, seen in May in southern Illinois. Much more commonly we saw only 1–3 birds per day.

### Distribution

The yellow-crowned night heron is a species of the eastern United States and Central and South America (Fig. 45). In Illinois it has a spotty distribution the length of the state (Fig. 47). Most of the records are recent, and undoubtedly additional nesting localities will be discovered. The species nested at least as far north as Depue in the 1930's (Bellrose 1938) and as far north as Cook County in 1949 (McMillen 1964). It is uncertain whether the increased frequency of records in the north (Nolan 1954a) reflects a population change or only more and better observers. The yellow-crown is known from Indian middens in Randolph County, dating back perhaps to 8000 BC (Parmalee 1959). Black-crowned night herons were not detected in the deposit. One record not shown in Fig. 47, for lack of specific locality data, is a record mentioned by Nolan (1954b) for an area south of Chicago.

### Nesting Habitats and Populations

Though nesting yellow-crowned night herons are sometimes associated with colonies of other herons, including black-crowns (Bellrose 1938, Nolan 1954b and 1955b, Brown 1962), they also nest solitarily or in small colonies of yellow-crowns only (Nelson 1876, Boughner 1960, Haertel 1963). Ridgway (1882) referred to a colony near Vincennes of "perhaps a hundred pairs," but no other colony on record for this region even remotely approaches that size. Nesting is usually in lowland woods, including second growth as well as mature stands (Ridgway 1882, Mayfield 1950b). Ridgway's (1882) description of Monteur's Pond near Vincennes may be an apt description of yellow-crown nesting habitat. The "pond" was a swamp about 14 km by 2 km with less than half its area in open water no more than 1.2 m deep. The rest of the area was in trees, chiefly willows 15–19 m tall, and larger ashes, red maple, and swamp cottonwood, with some oaks ("swamp, white, and water oaks"), sweet gums, and an occasional catalpa.

Of the five nest trees identified for yellow-crowns in Illinois, three were oaks, one an elm, and one a river birch (Nelson 1876, Haertel 1963). Ridgway





Fig. 44.—Adult yellow-crowned night heron, from a drawing by Beverly Sanderson. Similar in size (about 50 cm tall) to the black-crowned night heron, this species, with its bluish gray body, is distinctive. The immature of this species is similar to the immature black-crown (Fig. 40).

(1882) referred to nests near Vincennes, Indiana, that were “among” ash and sweet gum trees. Later (Ridgway 1895) stated that the nests were “in” sweet gum and oak trees and that the nests were placed high. Six Illinois nests had a height range of 11–18 m (average 14 m) (Nelson 1876, Gylleck 1960, Haertel 1963, and I. Wasson unpublished).

The vegetation and other characteristics of the nesting habitat have not been analyzed quantitatively, nor has the foraging habitat been defined. We have seen yellow-crowned night herons foraging in swamps and lagoons and even in plowed fields.

The cross-country censuses did not intercept any yellow-crowns either in 1907–1909 or 1957–1958,

probably only because of insufficient sampling of bottomland forest. Our more recent (1973–1977)

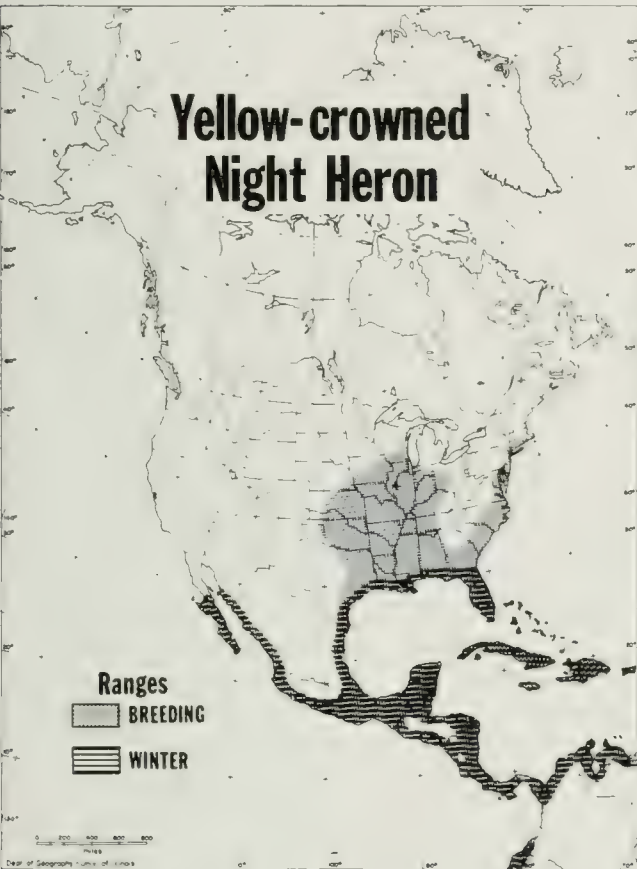


Fig. 45.—General distribution of the yellow-crowned night heron.

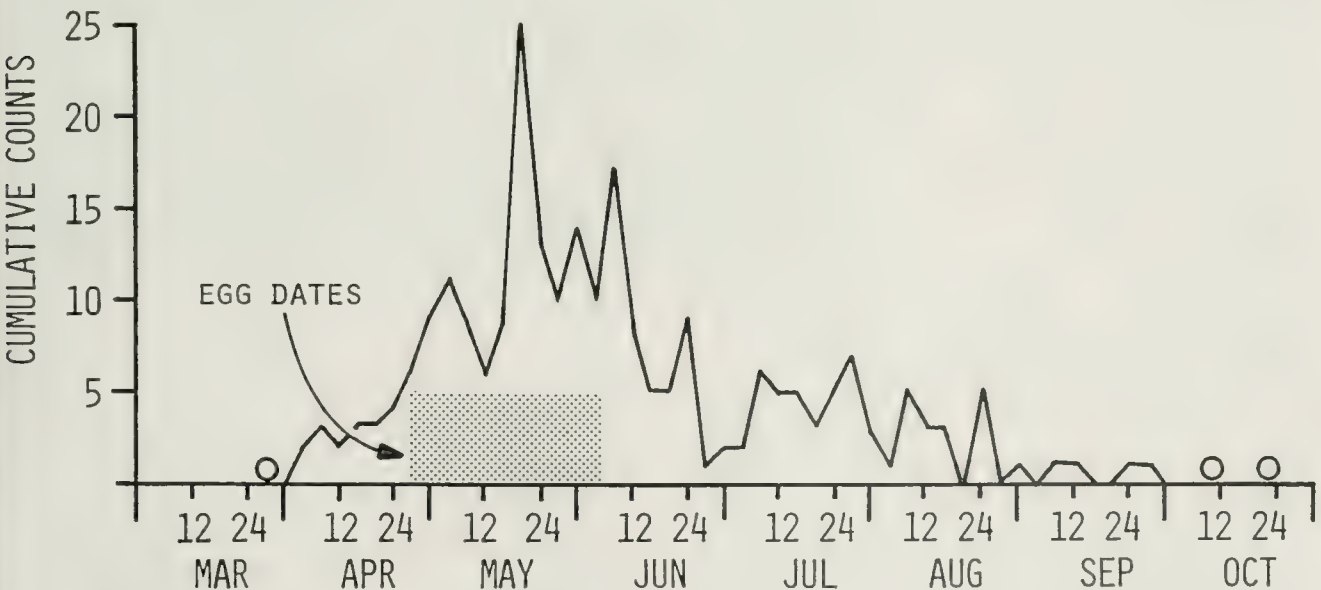


Fig. 46.—Cumulative counts of yellow-crowned night herons from all recorded observations in Illinois. The shaded area indicates the span of dates in which eggs have been found in yellow-crown nests (not the same as the egg-laying season). Circles indicate the earliest and latest records in the state.

strip censuses of 824 ha of mature bottomland forest in southern Illinois showed an average population of 0.54 yellow-crown per 40.5 ha, with annual variations (for all tracts) of from 0 to 1.2 per 40.5 ha. The highest population recorded was at Oakwood Bottoms (Jackson County), a consistently good area for yellow-crowns, where the population was 7.8 birds per 40.5 ha in 1975–1976 (42 ha censused).

The increasing frequency with which this species has been reported in recent years (Jones 1940c, Nolan 1954a, Anderson 1974b) may only represent increased interest by more and better observers. However, the total absence of yellow-crown records from the notes of such keen observers as Nelson (1876–1877) and Gault over such a long span of years (1875–1927) tends to support the view that there has been a population increase, at least in the north. Even so, the yellow-crown's population bears careful monitoring, both because the total Illinois population is relatively small (less than 1,000 birds), and because it nests in a threatened habitat.

### Nesting Cycle

Very little has been recorded on the nesting of the yellow-crowned night heron in Illinois or anywhere else (Palmer 1962), and there are no quantitative data on any phase of the cycle for any population. The courtship and nuptial behavior have apparently never been reported. The call notes are reported to be similar to those of the black-crown but higher pitched (Palmer 1962). We have never heard one utter a sound.

Nest construction was under way at New Boston by 28 April (Brown 1962), and a nest at Evanston



# Yellow-Crowned Night Heron

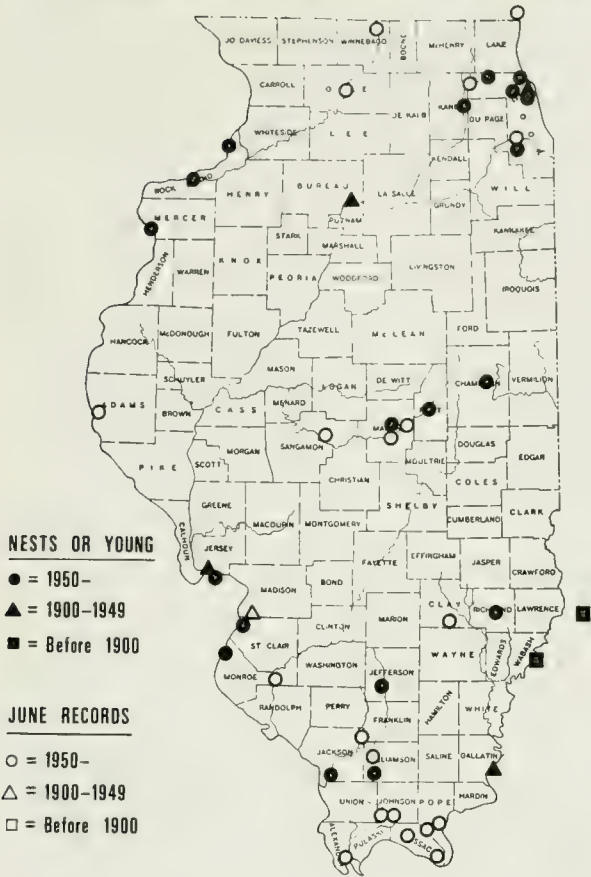


Fig. 47.—Distribution of breeding records of yellow-crowned night herons in Illinois.

was completed by 10 May (Nolan 1953b). The nest, which superficially at least, resembles tree nests of the black-crown, is often saddled on a branch well out from the trunk (Nelson 1876, Ridgway 1895), but is sometimes adjacent to the trunk (Haertel 1963). The eggs of the yellow-crown are very similar in color (pale bluish green), size, and shape to those of the black-crowned night heron (Reed 1965). The beginning of the egg-laying season is indicated by a female specimen with an egg in her oviduct on 27 April, when she was collected from her nest near Vincennes by Ridgway (1882). Eggs have been reported in active Illinois nests from 6 May to 4 June (Nelson 1876, Bellrose 1938), and we would expect the season to extend much later. The incubation period at an Indiana nest was estimated to be 24-25 days (Weeks 1976).

Excellent illustrations by McVaugh (1972 and 1975), showing the development of young night herons in North Carolina and Florida, suggest that the rate of development is similar in yellow-crowned and black-crowned night herons. The young are largely grown in 35 days, though the age of first flight of the

yellow-crown is apparently unknown. Data on the number of eggs laid are almost nonexistent. Two nests at Depue each produced four young that apparently lived to or near to the age of fledging (Bellrose 1938), and a nest near Elgin (Gylleck 1960) and one observed by us at Rend Lake each had three young though it is not known whether they fledged.

## Fall Migration

There are no data on the postbreeding behavior of yellow-crowns, the timing of the molt, or the fall migration. The migration has never been seen, and the available counts give no indication of an increase in numbers in late summer or fall, as might be expected (Fig. 46). Few are seen after August, but there are at least two October records, the latest 22 October (Fawks 1968 and 1971c, Fig. 46).

The yellow-crown is another species in which a distinctive immature plumage could, with systematic monthly counts, be used to determine age ratios as a possible measure of productivity, but the problem of finding a significant sample of yellow-crowns in late summer and fall must first be solved.

## Food

The food of the yellow-crowned night heron differs strikingly from that of the black-crown, particularly in the absence of fish from the yellow-crown's diet. Ridgway (1895) stated that the yellow-crown's principal food was crayfish and frogs though he gave no specific identifications. Quantitative data are needed on the subject.

## LEAST BITTERN (*Ixobrychus exilis*)

(Fig. 48 and 49)

### Spring Migration

As in the case of the American bittern, the secretive nature and specialized habitat of the least bittern make it difficult to obtain a quantitative record of its migration or any phase of its life cycle, and we have plotted all the records available to us to show when most of these birds have been seen (Fig. 50). Least bitterns have not been seen in Illinois before 7 April (Kleen 1974c), and are not seen with any regularity until late April or May (Fig. 50). More have been seen in May after the 8th than in any other month, but this probably has more to do with the timing of field work by human observers than with the population of the least bittern.

The migration is believed to be nocturnal but has never been observed (see under Fall Migration).

### Distribution

The least bittern is spottily but widely distributed in the United States and Central and South America



Fig. 48.—Immature least bittern. The smallest (about 25–30 cm tall) Illinois heron, the least bittern is rarely, if ever, seen in the open (this specimen was an injured captive). The adult has a dark back (blackish in the male, brownish in the female), with large patches of buff on the wings.

Fig. 49). In Illinois least bitterns have been found nesting mainly in the north, sometimes in the south, but rarely in central Illinois (Fig. 51). We would have suspected that this distribution only represented lack of coverage, but such experienced observers as Isaac Hess (Champaign County) and T. E. Musselman (Adams County) did not report nests from their areas. Because much of the state's marshland has been destroyed, there may be few suitable nesting areas left for the least bittern, but once they are adequately explored, a number of counties in all parts of the state may prove to have small nesting populations.

Least bitterns have been less frequently detected in Indian middens than have the larger American bitterns, but two records of leasts date from about 1800 to possibly 8000 BC (Parmalee 1959 and 1964).

#### Nesting Habitats and Populations

Least bitterns apparently nest only in marshes. In Lake County, Beecher (1937 and 1942) found dense populations in both lake and pond growths of cattails (12 nests in 4.2 ha of lake and 4 nests in 2.3 ha of pond growth) and *Carex lacustris* (lake, 4 nests in 2.2 ha; pond, 4 nests in 0.6 ha), but only one nest



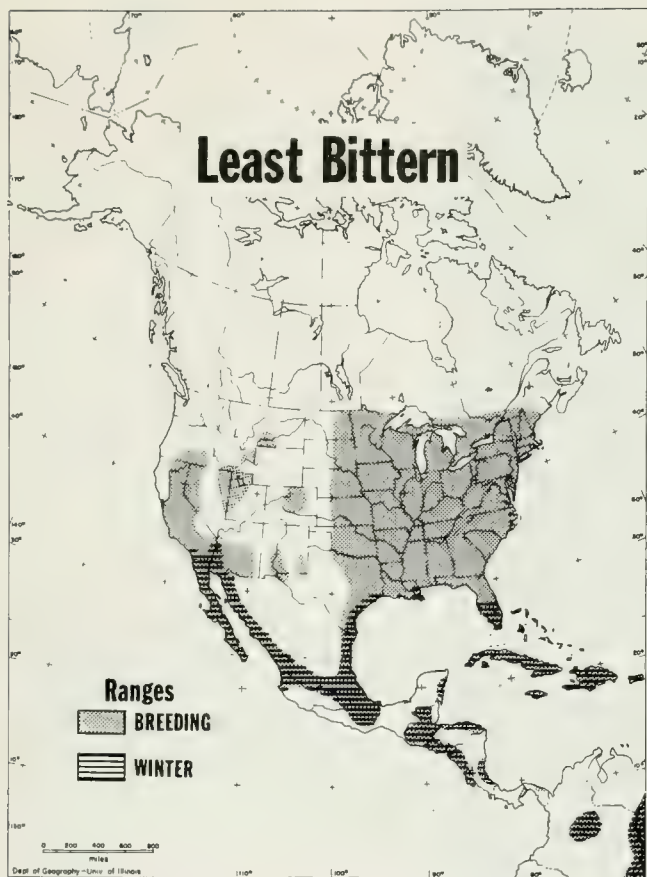


Fig. 49.—General distribution of the least bittern.

in 16.2 ha of mixed *Carex* species. The only habitat in which we encountered the least bittern on cross-country censuses was cattail marsh in Lake County (0 in 1957, 10 per 40.5 ha in 1958). Also in the central and southern regions nests were found in cattails (Lux 1892, Butler 1897, Bennett 1953). Murch-

ison (1893b) observed that least bitterns always nest over water—usually 25–46 cm deep—and he attributed the high population in Henry County in 1892 to adequate water. Coincidentally, the population was also high in that year at Calumet (Larsen 1893). In Lake County, Goelitz (1915) found nests over water about 1 m in depth. Murchison (1893b) pointed out that a difference between American and least bittern habitat is that American bitterns nest only around the edge of a marsh, whereas least bitterns nest throughout the marsh. Least bittern nests are placed in the densest stands of reeds (Barnes 1890a, Woodruff 1907, Bailey 1928). Territory has not been studied in this species, but Beecher's (1942) data show that the nests can be relatively closely spaced. In Iowa, Weller (1961) found active nests as close as 5–6 m. Abbott (1903) and Coursen (1947) noted that annual variation in least bittern populations is extreme. This variation may depend to a great extent on local water conditions (Nolan 1952).

### Nesting Cycle

The early phases of the nesting cycle from courtship to nest building have apparently never been witnessed in Illinois. Least bitterns appear to be relatively quiet birds, and the only call referred to in the Illinois literature is chatlike notes: "rock-rock" (Abbott 1903, Widmann 1907). Palmer (1962) referred to a dovelike cooing song uttered by the male in spring, but it is infrequently heard. Gault's extensive notes refer to the singing of this species only once (2 June 1912) in contrast to the numerous times when he heard the less common American bittern. Widmann (1907) noted that least bitterns become more active toward evening, the calls being heard especially then.

Whether yearling birds breed is apparently un-

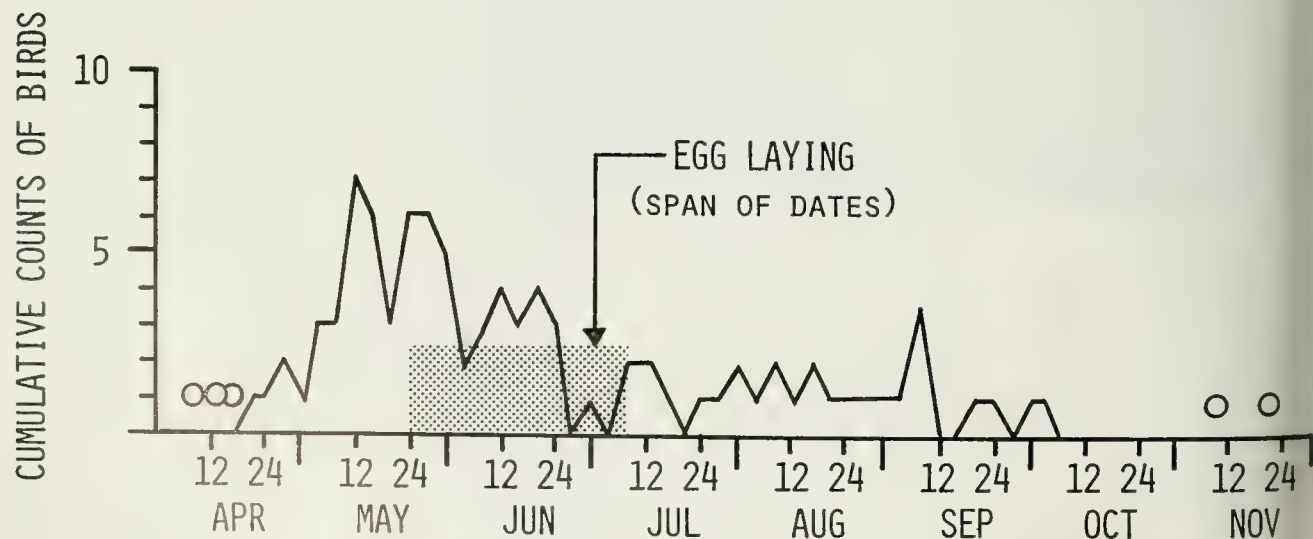


Fig. 50.—Cumulative counts of least bitterns from all recorded observations in Illinois. The shaded area shows the span of dates in which egg laying has been recorded. Circles indicate the earliest and latest records for the species in the state.

# Least Bittern

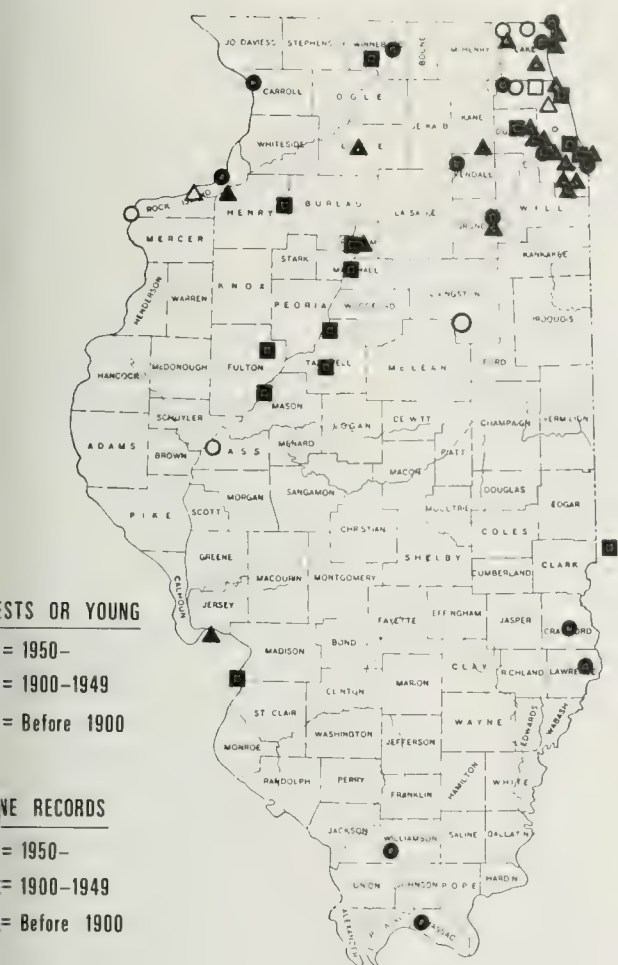


Fig. 51.—Distribution of breeding records of least bitterns in Illinois.

own. The nest is occasionally placed in a small rub in the marsh, but much more typically, in the marsh vegetation itself (Abbott 1903). The nest is rather frail flat platform, usually constructed of the reeds that surround the site folded over, about 30–40 cm above the water (Nelson 1876–1877, Murchison 1893b, Abbott 1903). On the Illinois River nests are rarely more than 30 cm above water (Barnes 1900a). Nests measured about 18 cm across and 8–15 cm in outside depth (Larsen 1893, Bennett 1953). The presence of the previous year's reed growth is apparently important as support and structure for the nest (Weller 1961).

The unmarked eggs range in color from pale blue, greenish, to nearly white (Larsen 1893, Murchison 1893b, Bailey 1928). Eggs are usually laid on consecutive days, but some females may skip a day in making a clutch of five or more eggs (Weller 1961). The usual clutch has been said to be four eggs (Lar-

sen 1893, Abbott 1903), but when we tabulated sets from the literature and museum records from northern and southern Illinois, there were as many 5-egg as 4-egg clutches, the distribution of all 78 clutches being: 7 eggs—1 set (1 percent), 6 eggs—4 (5 percent), 5 eggs—29 (37 percent), 4 eggs—29 (37 percent), 3 eggs—12 (15 percent), 2 eggs—3 (4 percent), with an overall average of 4.3 eggs per nest. Fifteen recent (since 1950) clutches from northern and southern Illinois had eight (53 percent) 5-egg sets, with only two sets (13 percent) each having 4, 3, and 2 eggs, and one (7 percent), 6 eggs, with an overall average of 4.3 eggs. These data were not collected specifically for clutch-size determinations, and may include some incomplete clutches. There were some references to nests with one egg, which were excluded from our tabulation.

The dates of fresh sets of eggs indicate that the laying season of the least bittern extends from at least 24 May to 8 July in northern Illinois, with the peak of laying in the first 2 weeks of June. Murchison (1893b) rarely found complete clutches in Henry County by 10 June and noted that few eggs showed more than 4 days of incubation on 14 June. At Calumet, Larsen (1893), who examined more than 50 nests in the first half of July, found only a few with eggs still fresh. An active nest with two eggs found by Peter Dring in Cook County on 1 August indicates that laying could have been at least as late as 15 July. Egg-laying dates for southern Illinois are very similar to those in the north. Murchison (1893b) noted that nearly all of the incubating birds he saw were males, but Weller (1961) observed that females did over half of the incubating.

In Iowa, Weller (1961) determined that incubation began with the first or second egg laid and took as long as 20 days for the first egg laid, but only 17–18 days for the last egg of the clutch. Larsen (1893) and Bailey (1928) found the incubating birds to be very shy, leaving the nest quietly when an observer approached. Young least bitterns apparently typically leave the nest long before they can fly and move about the marsh in the vicinity of the nest, returning to it occasionally. In Cook County, Lawrence Balch (unpublished) saw young bitterns leave their nest for brief but increasingly long periods at between 6 and 9 days of age. Bailey (1928) saw young leave the nest at 8 days of age though remaining nearby. The age of first flight of least bitterns is unknown (Palmer 1962).

No study of nesting success or productivity is available for any Illinois population of least bitterns. From 11 incomplete nest histories, nearly all from northeastern Illinois, we calculated the success of nests during laying and incubation to be 88 percent and of nests with young (to age 10 days) to be 66.5 percent and the overall success rate to fledging to be 59 percent. Successful nests produced 3.5 young per nest,



but the average production of all nests was only 2.0 young per nest. Causes of nest failure were unknown.

### Fall Migration

Relatively few least bitterns are seen after the nesting season (Fig. 50), and the number reported does not at all reflect the actual population. Few observers spend time in marshes, and the molting and departures of least bitterns go generally unnoticed. Loucks (unpublished 1894) saw many (possibly migrants) at Peoria on 17 August, and Dreuth's last record for Lincoln Park was 22 August (Clark & Nice 1950). Last-seen records of least bitterns often refer to September (Bennett 1953, Ford 1956, Woodruff 1907). An immature least bittern that we observed landed in Urbana on the night of 7–8 September and shows the migration definitely under way by that date. One killed on a television tower near Springfield on 1 October 1973 (Kleen 1974a) also indicates migration. It is as difficult to determine the end as the beginning of the migration of such a secretive species. The 3 October record for McGinnis Slough (Boulton & Pitelka 1937) may represent about the end of the regular migration, but there are at least two November records—9 November at Pere Marquette State Park (Comfort 1941) and 21 November in Cook County (Kleen 1977a)—the significance of which are uncertain.

### Food

We have found but two observations on the food of the least bittern in Illinois. The stomach of an adult female of the dark form (so-called *neoxenus*) from northeastern Illinois contained two sunfish, each about 8 cm long (Eifrig 1915a). Also in the northeast, Bailey (1928) observed the feeding of young, and in typical heron fashion the young bitterns "mobbed" the adult, grabbing her bill in theirs to induce the discharge of food. The one item identified was a crayfish.

### Specimen Data

The dark form of the least bittern—a relatively rare color phase of the species sometimes called Cory's least bittern—has been seen in Illinois at least once (Eifrig 1915a).

## AMERICAN BITTERN

### (*Botaurus lentiginosus*)

(Fig. 52 and 53)

### Spring Migration

American bitterns are found rarely in Illinois in winter. There is at least one February record (Ford

1956), but the earliest indication of the spring migration is seen in mid-March. Musselman (unpublished 1927) found a bittern in Adams County on 14 March, and Sanborn (1935a) reported one in Chicago on 17 March. More typically, the species is not detected in Illinois until late March or April, and peak numbers are seen after mid-April (Fig. 54). Smith's (1930) latest spring record for the bittern at Urbana (a place with no known breeding population) was 18 May, which probably represents about the end of the passage of transients at that latitude.

Because bitterns are secretive and solitary, few are seen, and it is difficult to obtain a quantitative record of their migrations and other activities. As we have seen no more than one per day, we have plotted cumulative counts of all available observers to show when most birds have been seen (Fig. 54).

The migration is believed to be nocturnal, and a bittern killed during a storm on Lake Michigan on the night of 16 April 1960 may have been migrating (Segal 1960).

### Distribution

The American bittern nests over much of temperate North America, wintering generally in Mexico and Central America (Fig. 53). In Illinois the range is very poorly known, and most of the nest records are old (Fig. 55). The available marsh and prairie habitats are dwindling seriously, and many of the old nesting areas are now gone. Additional nesting areas may be found, particularly on marshes of the major rivers, but most of the population is probably still in northeastern Illinois. In addition to the records plotted, July records for the Cuba area (Fulton County) may represent a nesting population (H. D. Bohlen unpublished).

The American bittern was an uncommon (about 0.2 percent of specimens identified) but regular component of Indian middens in all regions of Illinois, dating back to perhaps 8000 BC (Baker 1936 and 1941, Parmalee 1957, 1959, 1962a, and 1962b, Parmalee et al. 1972).

### Nesting Habitats and Populations

In northeastern Illinois Beecher (1942) found American bitterns nesting most commonly in *Typha* (cattails), *Scirpus* (bulrushes), and *Carex lacustris* (sedge), noting that nests were absent in a year of high water (Beecher 1937). B. T. Gault's unpublished notes have frequent references to the bittern habitat in Du Page and Cook counties as "grassy marsh," and Gault mentions having found at least one nest in bulrushes. He also found one nest in an upland field above a marsh. Eaton (1879) stated that the nest was usually in the middle of a slough but sometimes at the edge of a small slough or wet area in a pasture.

Fig. 52 (Opposite page).—American bittern (captive bird). This brownish, streaked, chunky heron (about 55–60 cm long) superficially resembles immature night herons. The black mark on the side of the throat is a distinctive character.







# American Bittern

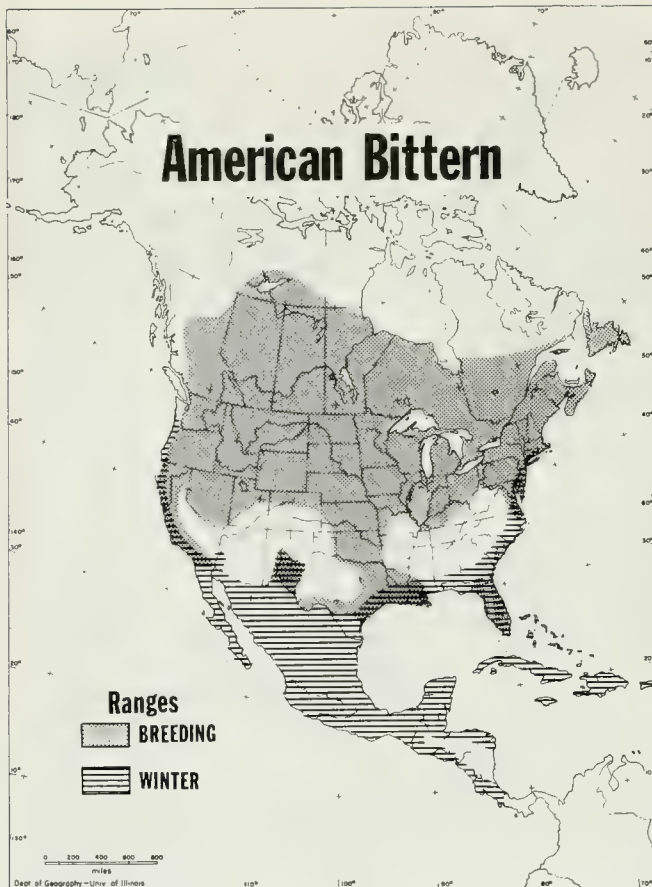


Fig. 53.—General distribution of the American bittern.

Nelson (1876–1877) believed the principal habitat of the American bittern to be prairie sloughs with rank swamp grass or rushes. His reference to the prairie may be pertinent to the general absence of bittern nesting records in the more forested areas of the state, though Woodruff (1907) stated that they nested on ponds in forests. We have seen only transients in low woodlands. Murchison (1893*b* and 1896) observed that bitterns preferred pond areas as nesting sites in Henry County. Nests are often over water just above water level. Murchison (1896) felt that the birds were not particular as to the depth of the water as long as there were plenty of rushes, including “round rushes,” though he noted that the population of bitterns was obviously reduced in a very dry year. He also observed that American bittern nests were likely to be on the edge of the marsh. In southern Illinois Bennett (1953) found nests in dense cattails and noted that nests were widely scattered; this is the general impression of most observers. Euspiza (1876) stated that he never found nests within a “mile” of each other in the Peotone area, and in Henry County Murchison (1896) found nests no closer than “100 yards.” At Calumet, Larsen (1893) found two nests about “50 feet” apart, but it is not absolutely clear that both were active. In north-

eastern Illinois, Beecher (1942) found one nest in 4.0 ha of cattails, and Bailey (1931) found a nest in a marsh 1.2–1.6 ha in extent. The minimum requirements are unknown, and such knowledge is increasingly important, as habitats, including marsh, are being carved into smaller and smaller pieces.

Populations of this species are apparently extremely variable from year to year, depending upon the condition of wetlands (Murchison 1896, Beecher 1937). In the cross-country censuses of 1957 we encountered American bitterns only in a Lake County cattail marsh, and our density figure of 10 bitterns per 40.5 ha is possibly exaggerated because of the small area (12 ha) covered. In 1958 we censused more (23 ha) of the same area and saw no bitterns. As very little (8 ha) marsh was censused in 1909, there are no useful comparative data with which to determine population trends. Nelson (1876–1877) called the American bittern a very common summer resident in northeastern Illinois, and the species was probably much more common then than it is now. This is evident in the number of transients seen in the Urbana area, where in the years 1903–1922 daily counts of American bitterns in April and May were commonly as high as three or four birds, and as many as six and seven were seen by such reliable observers as Frank Smith and F. C. Gates. In the same area now we feel fortunate to see one per day and do not see as many as six in the entire spring season. Causes of the decline other than the steady loss of habitat are unknown.

## Nesting Cycle

The courtship displays of the American bittern (as apparently for herons generally) are spectacular, though rarely observed. Stout (1934) described such behavior, observed in June near Barrington. It involved a kind of rhythmic circling dance by one bird (male?) around the other, and posturing displays of feathers, including a “star” of white feathers near the head. The ceremony continued for 40 minutes. Whether vocalizations accompanied the display was not stated, but the species does make impressive sounds. Butler (1897) described three vocalizations: (1) soft guttural notes audible only at very close range, (2) the song, phoneticized “plum-pudden” with the accent on “pud,” the phrase repeated four to eight times, and (3) the so-called stake-driver sound, phoneticized “ka-whack, ka-whack,” which Murchison (1896) compared to the sound made by driving a nail into a board. Eaton (1879) phoneticized the “song” as “chunk-a-lunk-chunk, quank” and stated that it could be heard a long distance on calm clear nights in spring. Hunter (1936) observed a bittern “singing” for 15 minutes, as it stood motionless. To produce the sound—“plunk-er-lunk”—the bird gulped air with a forward motion of the head

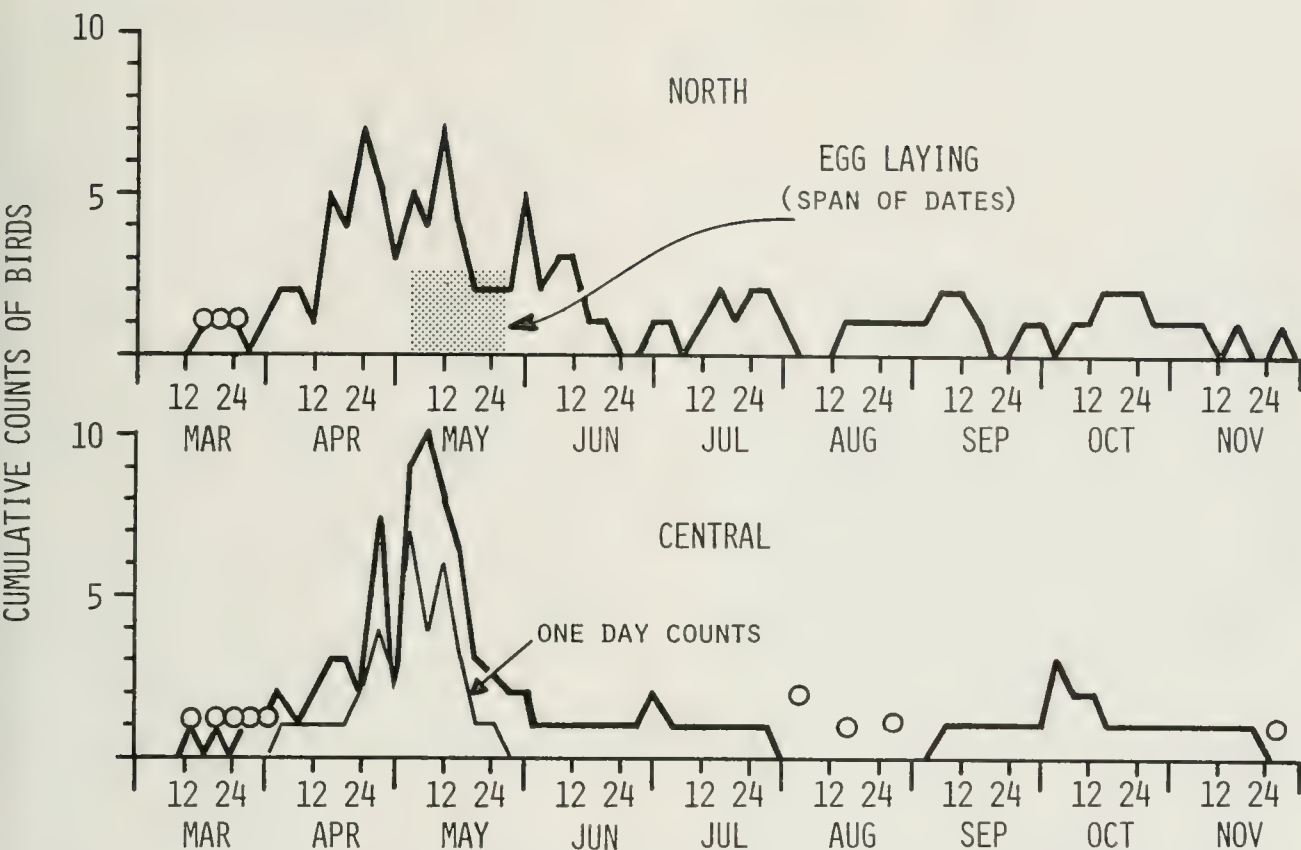


Fig. 54.—Cumulative counts (heavy line) of American bitterns from all recorded observations in northern and central Illinois. The thin graph line represents 1-day counts made early in the 1900's by Frank Smith and his students near Urbana. Circles represent isolated 1-day counts in recent years. The shaded area shows the span of dates in which egg laying has been recorded. There are too few data for southern Illinois to plot.

and snapping of the bill, after which it expelled the air rapidly. A fourth sound made by the bittern is a single harsh croak—"quark"—apparently a kind of alarm note (Eaton 1879, Murchison 1896). The sound of the song is referred to as "pumping" or "booming," and Benjamin Gault (unpublished 1889–1916) often heard the sound between 23 April and mid-June in Du Page County, frequently at night. In the same season William Loucks (unpublished 1892) heard the song frequently in Tazewell County.

Nest building has not been observed, but descriptions of nests range from "a mere depression in the ground" (Euspiza 1876) to "a bulky platform of rushes" (Larsen 1893). The most elaborate nest found by Murchison (1893b) was a structure  $61 \times 46$  cm across and 20 cm thick (presumably outside depth), but, on average, nests measured  $38 \times 25 \times 10$  cm. The nests are built of the dead stalks of the surrounding vegetation—usually bulrushes, cattails, sedges, and similar plants. Murchison (1896) believed the birds also built nestlike platforms on which they rested.

The eggs are unspotted and range in color from dark cream to yellowish drab to greenish (Eaton 1879, Murchison 1896). The average dimensions of

23 eggs from Henry County were:  $50.0 \times 36.8$  mm (Murchison 1896). Murchison observed one nest in which the second and third eggs were laid on consecutive days. Data on 38 clutches of American bittern eggs from northern Illinois referred to mainly in the older (pre-1900) literature showed the following distribution: 7 eggs—1 clutch (3 percent), 6 eggs—1 (3 percent), 5 eggs—10 (26 percent), 4 eggs—18 (47 percent), 3 eggs—5 (13 percent), and 2 eggs—3 (8 percent). Eaton (1879) pointed out that a clutch of seven eggs was very unusual and that most nests had four. There are no recent data on clutch size. Mainly from the dates of fresh eggs, we estimated that the laying season extends at least from 4 to 28 May in northern Illinois (Fig. 54). Two eggs in a nest found on 26 July in the Palos Hills area (Peter Dring unpublished) could have been laid at least as late as 1–2 July, i.e., much later than shown in Fig. 54. In Quebec, Mousley (1939) found the incubation period to be 24 days, beginning with the first egg laid. The young stayed in the nest about 2 weeks, but the age of first flight is still unknown (Palmer 1962).

The only indication of productivity is Bennett's (1953) observation that four pairs of birds observed in southern Illinois, 1950–1952, each produced two



young, though to what age they were reared was not made clear. In northern Illinois, Gault (unpublished) found single young bitterns out of the nest in June and early July.

Fall Migration

Compared with the numbers seen in spring, relatively few American bitterns are seen following the nesting season, and it is not known when most of the fall migration occurs (Fig. 54). Records of six bitterns seen in East St. Louis on 25 July (Wilhelm 1954), one in Alexander County in late July (Gower 1932), and two at Cape Girardeau on 24 August (Jones 1934) could have been either local breeding birds or migrants. A male American bittern (INHS specimen AR b-1) killed with other migrants at a television tower in east-central Illinois on the night of 8-9 September 1967 shows the migration to be definitely in progress by that date. The specimen was very fat and in fresh plumage, the molt also having

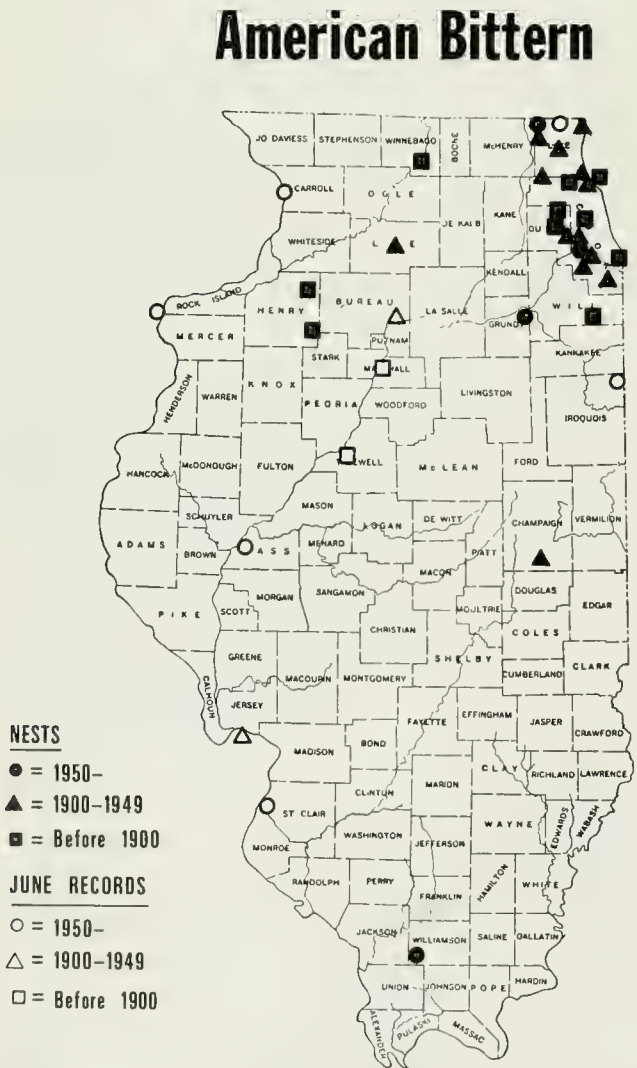


Fig. 55.—Distribution of breeding records of American bitterns in Illinois.

American Bittern



Fig. 56.—Distribution of winter (15 December-1 February) records of American bitterns in Illinois.

been completed by that date. At a tower in the same region another bittern was killed on the night of 6-7 October 1955 (Brewer & Ellis 1958). Gault's (1901) latest record in northeastern Illinois during an 8-year period was 19 October. Coursen (1947) indicated also that the bittern population leaves northern Illinois in October, but noted that a few sometimes remain until the marshes freeze. There are a number of records for November, spanning almost the entire month even in northern Illinois (Fig. 54, Ferry 1898, Lincoln 1927, Boulton & Beecher 1940, Clark & Nice 1950, and others). Some of these late fall records, and also winter records, may be attributable to the crippling of birds by hunters (see Musselman 1926), but an X-ray study of fall specimens is needed to determine the incidence of such cases.

Winter Records

Cooke (1885) and Ridgway (1881) indicated that the American bittern was a winter resident of south-

in Illinois at least in mild winters, but there are few specific records (Fig. 56) and no data on the size of the population involved. In addition to the records plotted, there is a winter record for Sangamon County of uncertain locality (Kleen 1974b). Bitterns were not detected in winter on the cross-country censuses either in 1906–1907 or 1956–1958, and we doubt that there is a sizeable or consistent winter population in any part of the state. In view of the species' secretive nature, it may merely go undetected.

## Food

We have found but two references to the food of the American bittern in Illinois. Gault (unpublished 1894) saw one eating a frog in July at Lisle, and we observed one swallow a large leopard frog whole in May. Both observations were made in wet woods.

## Specimen Data

Brodkorb (1936) suggested that there are recognizable eastern and western populations of the American bittern. He considered that specimens (12) from northern Illinois represented the eastern form (*B. l. ontiginosus*). Presently, the proposed races are not recognized by the American Ornithologists' Union.

A male specimen killed at a television tower in Vermilion County on the night of 8–9 September 1967 weighed 818.0 grams and was very fat.

## WOOD STORK (*Mycteria americana*)

Wood storks (ibis) have wandered up the Mississippi and other large streams in southern Illinois ir-

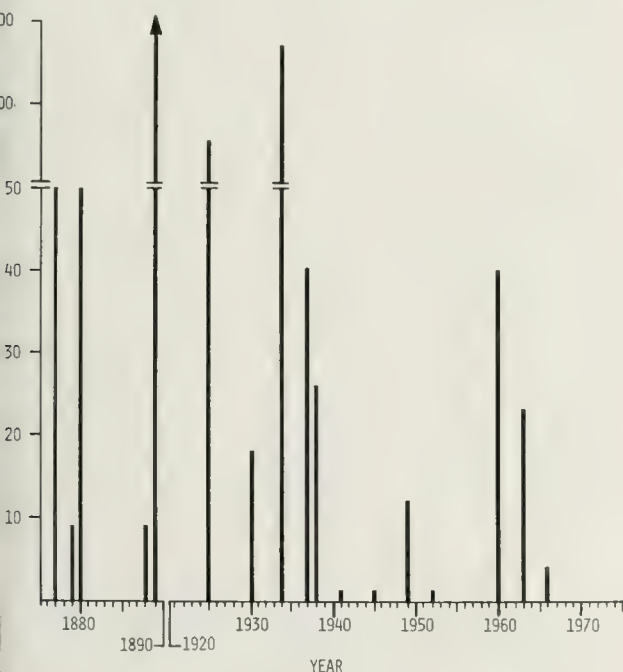


Fig. 57.—Numbers of wood ibis (storks) recorded in Illinois different years.

## Wood Ibis



Fig. 58.—Distribution of sightings of wood ibis in Illinois. None of these represent breeding records.

regularly but sometimes in considerable numbers (Fig. 57 and 58). Kennicott (1856) reported it common and thought that it probably bred in southern Illinois, though there was no proof of it, and now the nearest known breeding colonies in this country are in the southeastern Gulf states. It was also considered common by Ridgway (1874) and Nelson (1876 and 1877). Hurter (1881) wrote of 50 near St. Louis in "Marion County," Illinois, and "hundreds" were reported along the Illinois River (latitude 39°15') in 1889 (H.F.A. 1889). In other years only a few were reported: nine seen near East St. Louis in 1879 (Widmann 1880) and nine on the Wabash River 10 miles west of Mt. Vernon, Indiana (Evermann 1889). A number were reported in 1925: 50 in Jefferson County (Carson 1926), 25 in Lawrence County, and 1 found dead in southwest Richland or northeast Wayne County (Eaton 1926).

The next report of the species in or near Illinois was in 1930, when 18 were seen near the Ohio River



# Glossy and White-Faced Ibis

in Posey County, Indiana (Hicks 1934). Large numbers occurred near Illinois in 1934, when 130 or more were seen near University City, Missouri, and 44 near Cape Girardeau (Jones 1934). Thirty-five to forty wood storks were seen in Illinois across the river from Cape Girardeau in 1937 (Bolen 1937, Jones 1937d). In 1938, 7–26 were reported in the area around Freeburg and New Athens (Short 1938, Jones 1938b). George (1968) reported the species in Alexander County in 1941, in Perry County in 1945, and in Jackson County in 1949 (see also Mayfield 1950a). A single bird was seen at Horseshoe Lake, Madison County, in 1952 (Comfort 1952). Forty wood storks were seen by Paul Heye (Comfort 1961a) in Union County in 1960. Twenty-three to twenty-six were seen in Illinois near St. Louis in 1963 (Petersen 1963, Fleig 1971). The last report to date of the species in Illinois is of two seen on the Illinois River and two seen 3 days later at Quincy in September 1966 (Petersen 1967a, Musselman 1968b).

All of the Illinois records for wood storks, with one exception, have occurred in late summer from late July (Carson 1926) to 18 September (Heye in Comfort 1961a). The report of two birds near Quincy in May 1967 (Petersen 1967b) may be an error, since we can find no mention of the species in Musselman's unpublished daily notes for May 1967 nor does Musselman (1968b) mention them. Wood storks have often appeared in Illinois in dry seasons, and when seen, are around stagnant bodies of water in or near forest.

In general, the number of wood storks seen in Illinois seems to be declining.

## GLOSSY IBIS (*Plegadis falcinellus*) and WHITE-FACED IBIS (*Plegadis chihi*)

Dark ibis of the genus *Plegadis* are still recognized as two species by the American Ornithologists' Union. The two species are indistinguishable except in the nuptial plumage of the adults. In other plumages, glossy and white-faced ibis are not readily separable even in the hand except perhaps by bill length. Even Ridgway later questioned his identification of the 1880 Hurter specimen (Brewer 1958a). Thus, it is impossible to be certain which species is actually represented by the many Illinois sight records of dark ibis (Fig. 59).

Of over 30 reports of dark ibis in Illinois since Nelson (1876–1877), only a few have identified the birds as white-faced ibis; Comfort (1953) recorded five seen near Staunton, Macoupin County, in September 1952; one was photographed at Powderhorn Marsh, Cook County, in May 1965 (Balch 1965); two were seen in late April 1967 near Lacon, Marshall County (Princen 1968); and one was reported at Gorham, Jackson County, in May 1972 (H. D. Bohlen unpublished). Besides these records, there is the



Fig. 59.—Distribution of sightings of glossy and white-faced ibis in Illinois. None of these represent breeding records.

1880 Hurter specimen—taken near St. Louis—which may be of this species. Widmann (1907) writes of a white-faced ibis specimen taken in St. Charles County, Missouri.

Records of “glossy” ibis for northern Illinois include the following localities: northeastern Illinois (Nelson 1876–1877), Calumet Lake (Nolan 1953b, Graber 1962, Petersen 1969), Naperville (Hoger 1962), Barrington (Hoger 1963), Sparland (Fawks 1966a), Keithsburg (Fawks 1970b), and Grayslake and Pecatonica (Kleen 1975c). There is also a record for Powderhorn Marsh in Indiana (B. P. Brown 1966) and one for Credit Island in Iowa (Greer 1957).

Central Illinois records of dark ibis include those for Lake Decatur (Nolan 1956), Cuba (Fawks 1970a), Lake Kincaid and Mossville (Kleen & Bush 1972a and 1972c), Chillicothe (H. D. Bohlen unpublished), Danville (Kleen 1975c), and Havana (Kleen 1976b).

In southern Illinois and contiguous areas, the glossy ibis has been reported in these places: St. Louis area and St. Charles County, Missouri (Short 1939, Comfort 1955b, Petersen 1966b and 1969, Fawks

1971b); near East St. Louis (Mayfield 1951, Anderson 1971b); near Fort Chartres and Swan Lake (Anderson 1964b); in Alexander County, Illinois, near Cape Girardeau (Anderson 1971a); near Mitchell (Fawks 1971b); at Crab Orchard Wildlife Refuge (Kleen & Bush 1973); and at Union County Conservation Area (Kleen 1974a).

The white-faced ibis breeds spottily over much of the western United States. The glossy ibis breeds in the southeastern USA in very limited numbers. Palmer (1962) states that the glossy ibis (*P. falcinellus*) may actually be a fairly recent arrival from the Old World, as authentic breeding records for this country date back only to the 1880's. Both of these ibis are noted for wandering widely, and occur in Illinois only as wanderers. The greatest number of sightings in Illinois have occurred in late May, but dark ibis have been reported here as early as 27 February (Hurter 1881) and as late as 25 October (Fawks 1966a). Ryder (1967) writes that more white-faced ibis have been seen extralimittally before the breeding season than after, and suggests drought in nesting areas as a causal factor.

## WHITE IBIS (*Eudocimus albus*)

White ibis have wandered into Illinois on several occasions. Ridgway (1878) thought that he had seen a flock of seven or eight white ibis on 8 May 1878 near Mt. Carmel. According to Widmann (1907), four white ibis were reported at Quincy (no date given). In 1917 one was collected at Swan Lake, Greene County, in August (Smith & Parmalee 1955).

More recently, an immature (?) white ibis was seen at Marias Temps Clair marshes, which lie in Missouri just south of Elsah, Illinois, on 26 August 1962 (Anderson 1962c). Two were seen at Moredock Lake, Monroe County, in July 1963 (Anderson 1963b). The species was also reported from Kaskaskia State Park on 4 July 1963 and from Fults from 15 July to 3 August 1963 (Anderson 1964c). An adult bird was seen on the Mississippi River levees of Monroe County on 2 and 3 May 1964 (Hoger 1964, Anderson 1964a). An immature white ibis was observed with little blue herons at Gilbert Lake, Jersey County, on 6 August 1977 (H. D. Bohlen unpublished).

Since this ibis is nonmigratory, birds appearing in Illinois may have been caught up (entrained) in flocks of northward-wandering herons, which were their associates in rookeries during the breeding season.

## ROSEATE SPOONBILL (*Ajaia ajaja*)

It is interesting that the only specimen of this species for the state of Illinois is a skeleton found in a Hopewell Indian grave of the period 150–250 AD

in Calhoun County near Kampsville (Parmalee & Perino 1970). It may have been that such a rare and unusual bird was a great trophy, which was buried with its collector.

Musselman (1968a) refers to spoonbill remains from Indian mounds near Peoria; however, we are unable to find any other reference to this find. Ridgway (1880) mentions specimens taken in the Mississippi bottoms of Illinois below St. Louis in the 1860's. Cory (1909) gives the date as about 1859. The collector, a Mr. Wolle, said that it was not uncommon there at that time. A roseate spoonbill was collected by O. C. Poling in Adams County on 28 April 1887 (Musselman 1921). Whether this is the bird referred to earlier by Musselmann (1916–1917) is unknown. The location of this specimen is unknown.

## AMERICAN FLAMINGO (*Phoenicopterus ruber*)

Of accidental occurrence, the flamingo has been recorded a few times in Illinois. In 1959 a flamingo was reported in Adams County near La Grange, Missouri, on 1 September (Harford 1959). Later that year one was seen at Banner, Fulton County, on 28 September by F. Luthy (Mumford 1960a) and on 3 October at Ingraham Lake near Snicarte, Mason County, by A. Russ (Luthy unpublished). All of these reports could have been of a single bird moving about. There was an additional report of one on 8 August 1959 at Havana, Mason County (Mumford 1960a); however, since this information was supposedly from T. E. Musselman, who has no record of it in his field notes, we wonder if it could be an error in reporting.

Another series of flamingo sightings were of a bird that escaped from the Lincoln Park Zoo in Chicago on Memorial Day 1966 and was seen a number of times in the area until September (Petersen 1966b, Schulze 1966).

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